

Thomas Muir
In Classe Anatomica
Discipulus,
 INGENIO AC LABORE
Insignis,
 PREMIUM HOCCE

Merito Consecutus Est.

Apud Coll. Glasg. } Jac Joffray
 Imo die Martii, } Professore.

—Sicem Sculpse—



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THE
PRINCIPLES OF SURGERY,
 AS THEY RELATE TO
 WOUNDS, ULCERS, FISTULÆ, ANEURISMS,
 WOUNDED ARTERIES,
FRACTURES OF THE LIMBS, TUMORS,
 THE OPERATIONS OF TREPAN AND LITHOTOMY.

ALSO OF
 THE DUTIES
 OF THE
 MILITARY AND HOSPITAL SURGEON.

BY JOHN BELL.

A NEW EDITION,
 WITH
 COMMENTARIES, AND A CRITICAL ENQUIRY INTO THE PRACTICE
 OF SURGERY.

BY CHARLES BELL,
 PROFESSOR OF ANATOMY AND SURGERY TO THE ROYAL COLLEGE OF SURGEONS IN
 LONDON, SURGEON OF THE MIDDLESEX HOSPITAL, ETC.

IN FOUR VOLUMES.
 WITH ENGRAVINGS AND MARGINAL ILLUSTRATIONS.
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PRINCIPLES OF SURGERY,

AS THEY RELATE TO

WOUNDS, FRACTURES, AND DISEASES OF THE LIMBS.

BY JOHN BELL.

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THE OPERATIONS OF THE ART, AND THE HISTORY

OF THE

THE DUTIES

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DISCOURSE I.

ON FRACTURES OF THE LIMBS.

INTRODUCTION, CONTAINING A HISTORY OF THE OPINIONS AND PRACTICES OF THE OLDER SURGEONS.

PERHAPS there is no subject more interesting to the practical surgeon, than this of fractures of the limbs ; yet I would neither deduce its importance from the frequency of simple fractures, where the limb becomes shapely or remains deformed, according to the skill of the surgeon ; nor from the shock which the whole system feels in consequence of a lacerated fracture, where fever and death not unfrequently ensue ; nor from the destruction and crushing of the limb, protrusion of the bones, and laceration of the joints, which make injuries of the limbs almost as inevitably fatal as wounds of the great cavities : nor, lastly, from the difficulty which all liberal men acknowledge of deciding, whether a limb thus shattered should be sacrificed or preserved at the imminent risk of the patient's life. These are indeed natural difficulties, but they are such as we should feel very slightly, were not this one of those subjects which has fallen into almost inextricable confusion !

none, I believe, requires more to be historically explained.

Ask a young man who has studied his profession faithfully, what he would do with a fractured limb? he cannot tell. Ask the same question of one who has practised his profession long, who has, moreover, practised it well and sensibly? He can hardly tell how he himself is accustomed to manage a fractured limb! He has no rule nor settled method! he waits for the particular case, trusts in his own consciousness of sense and experience, and provides for difficulties only after they have come upon him. Ask the man of books and study what have been the doctrines of the old, or what have been the actual improvements of the modern surgeons, he also is at a loss! theories, bandages, machines, improvements innumerable, he can well remember; but, together with these recollections, this conviction always rests upon his mind, that the subject which he has long regarded as the most interesting is the only one which he has in vain endeavoured to understand.

Degrading as this may appear to our profession, it is, I fear, but too certain, that while more has been written on the subject of fractures than on hernia, lithotomy, amputation, or trepan, yet no two books correspond, no two authors agree, even on the general points of practice; and every surgeon, whether in the army or in the navy, in a village or in a city, sets a broken limb as he writes his name, after a fashion of his own. There is no rule nor principle yet established; this is almost the only department of practice which has been continually changing, without ever being improved.

When I revolve in my mind various methods of

explaining this perplexed subject to you, the following points present themselves as the most natural divisions of my discourse. They contain general views, which will enable me in the end to lay down correct and absolute rules for your conduct, and will also, if I do not deceive myself, give some degree of consistency and steadiness to your practice.

First, We will consider the opinions, the prejudices, the formal operations, and the daring practices of the older surgeons, who took upon them to regulate the quantity, the form, and the consistency, even of the callus ; to pare it when exuberant, to repress it when unshapely, and to break it when they were at any time displeased with the form of the limb. The discussion of their doctrines will serve as a general theory for the subject ; and in the course of it I will attempt to explain to you the process of healing as it goes on within a broken limb.

Secondly, I will explain to you the definitions and arrangements of fractures. Definitions are now too much neglected and contemned, because the old writers delighted only in this false science, and were skilful in nothing but intricate arrangements and unmeaning distinctions. But, in truth, the definitions and distinctions of fractures are of the very highest importance ; the very name of each species of fracture should convey to the mind of the student the idea of some peculiar decisive line of practice. Good arrangements in our science are like an artificial common sense, by which those who have not natural ability to decide upon any individual case are taught their duty by its place in the system ! Arrangement is thus a necessary preliminary to general rules ; and I shall so arrange my definitions, as that each sub-

division of the subject may turn out a distinct and marked case.

Thirdly, I will explain to you the accidents of the hip joint, its luxations, its fractures, its lingering suppurations, caries, and anchylosis ; and I believe there is no subject within this department of fractures, which can be equally interesting to you ; for the joint lies buried so deep among the surrounding muscles, that its accidents are apt to be mistaken even by the most experienced surgeons, while protracted suffering, and incurable lameness, are the consequence of the slightest mistake.

Fourthly, The fracture of the thigh bone I shall consider as a distinct subject deserving particular notice. The retraction and shortening of the thigh is an unavoidable consequence of the vast size and power of its muscles ; it is in this case alone that the limb is remarkably shortened ; and the ingenuity of surgeons has been employed for ages in inventing machines to resist this retraction, which, however ingenious, have produced nothing but torture to the patient, and disgrace to the surgeon.

Yet these machines, imperfect as they are, shall be explained ; and were there much of this kind to praise, it should not be passed over in silence. But I may perhaps do you some service by explaining the simple principles of this department of surgery, and then you will be able to enter into the magazines of Scultetus, Hildanus, and Paræus (filled with engines not unworthy of the chambers of the inquisition), without being tempted to bring out along with you any of their lumber.

Fifthly, While explaining these various subjects, I hope to make you gradually acquainted with the

true principles of surgery ; and it is only after having accomplished this, that I shall think myself entitled to lay down rules for each individual case, or to close these discourses with general aphorisms.

Perhaps you are chiefly anxious to learn how you are to bandage a fractured limb ; but in the very opening of this subject, I must declare, that if there be any great and general error in ancient or in modern surgery, it is that of bandaging a fractured limb. It seems to have been by the number of turns, or rather by the number of bandages which they could roll round a limb, that surgeons at one period estimated their own skill. They have left us no doubt of their intentions, for this was their theory, and they were proud of it, “that while the callus was still soft, it was moveable, and you could mould it by compression and bandages just as you could model putty in the palm of your hand.”

The Arabians attended in a particular manner to the form of the callus ; its exuberance was supposed to be a sure consequence of a slack bandage, the deformity of the limb was imputed to this cause, and was considered as a disgrace to surgery ; they took upon themselves the whole management of the callus. Such was the firmness with which the Arabian surgeons applied their bandages, that not only while the callus was growing, did they draw their bandages within a very hairbreadth of producing gangrene, but they continued them afterwards to prevent the prominence of the callus, till, by their tightness, the limb was wasted ; and much trouble had they in plumping it up again, “by filling the man with wine, and pleasant tales, and luxurious bathing, and plas-

tering the limb with pitch, to draw the nutritious juices that way *.”

If all the surgeons of Europe had been bone-setters, merely learning their trade by tradition, they could not have delivered down the Arabian methods of firm bandaging more carefully than they have done. They have described, even in the most simple fracture of the leg or fore arm, three or four bandages rolled one above another, with splints, and cushions, intricate and innumerable, as if a limb could never be too securely tied. Each bandage was of many ells long. Of these three rollers, the first was passed round and round the part immediately fractured ; by which rolling, and by certain compresses, which they sometimes laid in a circular direction about the fracture, they expected to regulate the shape of the callus,

* This wasting of the limb, its causes, and its cure, are explained in Albucasis. The effect of such bandages we must suppose to have resembled expressly that wasting of the limb which lame sailors and other mendicants contrive to produce by firm bandaging, and never fail to mark by a red garter twisted round the limb. *Quando restauratur fractura ossis, et remanet membrum post illud subtile, debile : tunc non sit illud nisi propter causas multas. Quarum una est, multitudo solutionis, ligamenti, et ligationis ejus non secundum quod oportet : aut propter superfluitatem stricturæ ligamentorum, donec prohibeatur nutrimentum currere ad membrum : aut propter multitudinem embrocationis superflue in non sua hora : aut propter paucitatem sanguinis in corpore infirmi, et debilitatem ejus. Et curatio illius est, cibare infirmum, et tenerum facere corpus ejus, donec multiplicetur sanguis in eo. Et administra balneum. Et intromitte gaudium et lætitiā super eum. Deinde pone picem super membrum : ut attrahat pix ad ipsum nutrimentum multum. Et assiduet embrocationem ejus cum aqua tepida, donec currat nutrimentum, et redeat ad figuram suam naturalem.*

We are sorry to see one so often quoted, and of such high authority in surgery as Fabricius, copying the absurdities of Albucasis, directing the same nourishing diet, the same warm bathing, with this pitiful conceit of his own, “to bathe the patient in pure water, in which it will not be amiss to boil some beef.”

to prevent knots, and to limit its growth. The second passed spirally round the leg or arm, all its turns winding from below upwards; for this spiral bandage they could not give so fair a reason, but of the third roller they could give a good account; the third roller passed spirally round the limb from above downwards, "to antagonize the spiral turns of the second." Over these three rollers were laid cushions or pads of linen, folded of such thickness as to have the effect of compresses, four of which, moistened in spirits and vinegar, were laid along the limb. These also were for the purpose of regulating the callus, and were kept in their place by being rolled with a fourth bandage*. Over these bandages and compresses were laid the splints, made sometimes of stiff pasteboard or thin deal, sometimes of sticks with straw rolled round them, sometimes of plates of metal, as brass or steel; and these splints, which were much too short to have any command of the limb, or to make any compensation for the suffering of the patient, were secured with a fifth roller, which is seen in this drawing of Scultetus. Nay, even such a writer as La Motte is proud of having dressed a leg, which was broken in two places, with two dif-

* When the callus was knotted, and the leg clumsy, it was always ascribed to the unskilfulness of the surgeon. Witness the following passage from the great Petit.

"Le cal est difforme pour n'avoir pas été suffisamment borné par le bandage, ou parce que les os n'ont pas été bien réduits. Il n'est pas toujours possible de borner l'accroissement du cal, particulièrement quand la douleur, l'inflammation et autres accidens empêchent de faire un bandage serré; mais il arrive souvent que le cal n'est difforme que par la faute du chirurgien, comme lorsque sans raison il ne serre pas suffisamment et également le bandage, pour s'opposer de toutes parts à ce que le suc osseux ne s'épanche dans le voisinage de la fracture. La difformité du cal est plus grande dans les fractures qui n'ont pas été bien réduites, tant parce que les

ferent sets of short splints, one near the ankle, and another near the knee *.

The leg, at every turn of each of these five rollers, was lifted up and handled, with great torture to the patient ! When this bandaging was finished, the limb was as big as his body ; and long before it was brought to that size, the surgeon and all his assistants were exhausted with the work †. The old surgeons were as curious in the days appointed for taking off these bandages, as a midwife about the periods of giving suck after delivery, or rising from bed, or going to church. They took off the splints on one appointed day, the pads or cushions on another, and the innermost rollers on a third. They had even a bandage which they put on during the weeks of convalescence, after those with which the limb was first dressed were removed.

These were bandages which none but a regular surgeon could apply ; and to say the plain truth, I think we have very innocently followed down to the present day practices contrived in mere cunning, and which had no other purpose than to preserve the trade of surgery, in all its branches, to its rightful owners.

On these bandages the whole of the cure seemed to rest, and therefore the surgeons were inexorable

bouts de l'os montent l'un sur l'autre, que parce que le bandage ne peut pas comprimer également, ni par conséquent borner, comme il conviendrait, l'accroissement du cal."

* These splints of straw, &c. were not flat, but made of a pretty thick rod, like the thickest hazel switch, and wrapped round with straw till it became as thick as a batton. They were somewhat similar to our *junks*, which are very useful.

† Pott represents the process, even in our own times, as so tiresome, " that the labour of rolling a limb is among his objections to the practice." Vide page 401.

in refusing to take them off before the day appointed by canons of surgery. No wonder that they permitted their patients to suffer any degree of pain, to fret during the day, and cry during the night, rather than undertake to undo an apparatus so absurdly complicated. Verduc says *, “Let the patient cry or roar ever so much, this is still a certain rule, that if your bandage is right, all the most considerable pain will cease in twenty-four hours ; for such patients make a great deal of noise and whining for a trifling pain.” This advice of Verduc needs no comment ; it implies that these ways of bandaging were attended not only with pain but with danger. The degree of swelling in a bandaged leg was watched with extreme anxiety. It was in the surgery of those days a canonical rule, that the limb should be so bandaged, that there should be a slight degree of tension and swelling, so as to indicate a degree of straitness in the bandage, but not much, lest the limb should fall into actual gangrene. Thus the patient lay in imminent danger ; the apparatus was such as could not be easily undone ; the surgeon was often far off ; the patient thought it his duty and his interest to bear that pain which he was made to believe was necessary to his cure. Even when the surgeon was present, he had so little regard for his patient as to let him “roar and cry” sometimes a little too long ; and the consequences of this are well known, for the tightness of the bandage of a fractured limb has been mentioned among the causes of gangrene in all the books of surgery, and the marks of this tendency to gangrene have been carefully noted †. This gangrene from a

* Page 399.

† Mr. Gooch, Dr. Aitken of Edinburgh, in their Treatise on Fractures.

tight bandage was a frequent accident; no old book is without examples of it; every one blamed another, though no one had the honesty to accuse himself. Surgeons were, indeed, deeply interested in this species of gangrene, and wrote much about it; it must, indeed, have been a sorry sight for the surgeon to see in the unbandaged parts (that is, in the extremities of the fingers or toes) that swelling, and livor, and vesication, which marked approaching gangrene! He must have shuddered at the thought of the patient or his friends being still under no alarm, while he himself knew that, in less than twenty-four hours, the limb would be entirely gangrened, and would in a few days drop off a mere putrid and stinking mass, leaving nothing for the knife to separate but the ligaments holding together the black and naked bones.

I would no more be guilty of an untrue accusation against those who lived two hundred years ago, than against a living author. This is the truth, and nothing but the truth, and might be my warrant for rejecting altogether this practice of rolling broken limbs.

In the present day, though there are doubtless few so entirely ignorant as to think of modelling the callus by the tightness of their bandage, yet there is hardly any surgeon who does not think it his duty to bandage a fractured limb, for there is an apprehension of another kind which has taken strong hold on the public mind! It is a more rational, and therefore a more dangerous prepossession, "that the slightest motion will discompose the callus, that frequent accidents will prevent its being formed at all." And worst of all, it has been universally believed (to use the words of the very latest writers on the subject)

“that the smallest alteration of posture, for the sake of ease, will often defeat all that has previously been done *.” The old doctrine goes upon new wheels ; the ancients used firm bandages to keep down the callus, and modern surgeons use firm bandages to keep the limb steady during the cure.

There can be no doubt that perpetual motion will prevent the continuity of vessels betwixt the ends of a fractured bone being restored, just as perpetual motion would prevent the adhesion of an external wound ; and you may imagine, that when the ends of the bones are by continual motion prevented from uniting, they will become smooth. You can also easily imagine, that while the continuity of the vessels of the bones is obstructed, the membranes and surrounding parts will heal, and will seem to surround with a capsular membrane that cavity which is preserved by the motion of the bones.

This is what is called an accidental or unnatural joint, which happens most frequently after fractures of the two bones of the fore-arm, though sometimes it happens in fractures of the single bone of the arm. When the fore-arm is broken, the patient, after the first inflammation has ceased, feels not much pain ; and if he persist in moving his arm, he at last moves it with ease, and establishes his unnatural joint. An old woman came to me with her fore-arm broken ; the broken part of the arm bent so that the hand hung dangling to one side of the arm. When she showed it me, she turned and tossed the loose hand in the air with a degree of indifference which surprised me, for the arm had been but eight days

* Vide Mr. Gooch, Dr. Aitken of Edinburgh, in their Treatises on Fractures, &c.

broken. I set the arm with splints, put many firm rollers about it, slung it round her neck, and also tied it with a roller to her side, and gave those operations an air of importance, to prevent her undoing the bandages.

She was one of those tipsy, crazy creatures, that you hardly know whether to think mad or drunk. I dare say she was no sooner out of my sight than she undid all the bandages. She kept an apple stall, and never rested from doing all the trifling things about it. She returned to me five or six times with her arm, sometimes with the rollers quite slack about it, but more frequently without splints or bandages, till in the end, she had an unnatural joint formed within three inches of the wrist. A shoemaker who had broken his fore-arm would not be restrained from working at his trade, and an unnatural joint was formed. When the bones fail to unite, they move like a second wrist, and the hand is weak, or rather useless. Sometimes, notwithstanding the difficulty of the radial and ulnar arteries, the surgeon has cut upon the wrist, pushed out the two ends of the bones, through his incisions, pared the ends of the bones, and replaced them; and laying the arm after the operation on a steady splint, like a compound fracture, the bones have perfectly re-united.

This is an accident long ago observed. Du Verney, page 129, mentions the dissection of a man who had such a joint formed about four fingers' breadth above the wrist; the upper ends of the two bones, the radius and ulna, were united by a clumsy callus at the place of the fracture; and on the face of that broad callus was formed a sort of socket, which received the lower fractured ends of the bones, which

were smooth, and accommodated to the socket ; the socket, indeed, was moulded upon the ends of the bones *.

Every thing plainly shows that the older surgeons believed callus to be a mere inorganic concrete, a fluid poured out from the extremities of the ruptured vessels, which was soon hardened into bone ; that it set or hardened like stucco or Paris plaster, and if not discomposed during this process, hardened into the consistence of bone. They described it always as “an exsudation of the bony juice,” and certainly imagined it to run like lead from a plumber’s ladle, and, like it, to concrete, after being poured out from the ends of the bones. They thought callus a juice which distilled from the ends of the broken bones as gum from trees, sometimes too profusely, sometimes too sparingly. The reunion of broken bones, and the hardening of this callus, they familiarly compared with the glueing together of two pieces of wood, or the soldering of a broken pot †. The callus they supposed to be a peculiar juice circulating in the bones, ready to be poured out, so as to reunite them when fractured ‡ ; and they imagined that it some-

* See also Palfin.

† “ Car ainsi que l’on joint les pieces de bois avec de la colle, ou les potiers d’estain leurs pots ; ainsi nature cement les os rompus avec le callus.” AMBROSE PARÉE, p. 343.

Nor is this the peculiar doctrine of the age in which Parée lived, it is the doctrine of the French Academy. We find in every page of their works such expressions as these, “ Un exemple singulier de l’effusion irregulier des suc osseux congelés en forme de stalactytes.”

Pott continually repeats expressions of the same import, as, “ that callus is a particular juice circulating in the bones for their particular nourishment.” “ This callus, or uniting medium,” &c.

‡ “ Generatur autem callus ex ossis alimento, quod a labiis fracturæ exsudans circum ossa fracta concrescit. Et licet non sit os, ita tamen durum est, ut si membrum illud rursus frangi contingat,” &c.

times flowed into the joints so as to cause ankylosis, and often caked and knotted about the broken bones so as to form a clumsy, prominent, unsightly lump. They imagined that callus was a juice which infallibly congealed in a marked period of time, and therefore they appointed particular days for undoing the bandages of each particular fracture. They supposed that its exuberance might be suppressed by a firm and well rolled bandage, its knobby deformities corrected by pillows and compresses ; that it might be thumbbed and modelled by pressure into a perfect shape.

The absorbent system is of more importance than is generally observed ; for while the absorbents have been represented as useful only in removing the excrementitious and spoiled parts of the body, in taking up extravasated fluids, removing tumors, or conveying away parts corrupted by disease ; these are, in truth, but trivial and occasional functions of the absorbents, which are the great means of forming, preserving, and indirectly of nourishing the system. The necessity of a continual supply of food implies an incessant waste and absorption ; the parts must be taken up by the absorbents before they be replaced by the arteries. The actual materials of which the living body is composed are in perpetual fluctuation ; all its parts are continually secreted anew ; the secretion of the parts is expressly proportioned to the action of the absorbent system, which is ever making room for new depositions. It is this continual absorption and deposition of earthy matter which forms the bone at first, and enables it to grow with the growth of the body ; it is the unceasing activity of the vessels of a bone, which enables it to renew itself

when it is broken or diseased; it is, in short, by various forms of one secreting process that bone is formed at first, is supported during health, and is renewed on all necessary occasions. Callus is thus a regeneration of bone, organized by the same action with that by which the original bone is formed. The callus begins to be formed after a fracture, as soon as the continuity of vessels is re-established, and their healthy action renewed. Bone is a secretion (as, indeed, the whole solids of the living body are but a secretion) originally deposited by the arteries of the bone, which arteries are employed in renewing it continually. It is not a concrete juice, deposited merely for the occasion of filling up the interstice betwixt fractured bones, but a fair regeneration of new and perfect bone, with its needful apparatus of arteries and veins, and of absorbents, by which its earthy matter is continually changed like that of the contiguous bone. Callus, indeed, could hold no connexion with the contiguous bone, were it that inorganic concrete which was once supposed *.

Even after exchanging the old doctrine for a more perfect physiology, surgeons have continued still under this apprehension, that the slightest motion would disturb, or totally ruin a callus just about to

* How could we otherwise, than by this doctrine, account for the reproduction of bone, where large pieces are lost? Sometimes the wheel of a waggon squeezes out a piece of the tibia two inches long; or a part of a bone is destroyed by caries, and is exfoliated; or a piece of a long bone is boldly cut out by the surgeon. If, for example, three inches of the tibia, or of the radius, are thus sawed out, the other bone, the ulna, or the fibula, keeps the limb of its right length, the two cut ends do not approach each other; we see them healing by a spongy intermediate flesh; we see nothing but red, lively, bleeding granulations filling up the interstice; and when the cure is accomplished, we find that the secretion of bone is perfect, and the limb strong, and the new bone quite hard.

form. But it is an ignorant fear, proceeding merely from not having observed the state of the parts ; for, in truth, when callus forms, the perfect constitution of the bone is restored ; the arteries pour out from each end of a broken bone a secretion which coagulates ; the vessels by which that gluten is secreted extend and multiply in it, till they form betwixt the broken ends a well organized and animated mass, ready to begin anew the secretion of bone. Thus you may perceive, by the plainest induction, that the ends of the bones are, when the bony secretion commences, much in the condition of soft parts which have recently adhered ; and it is only when there is a want of continuity in the vessels, or when want of energetic action incapacitates them from renewing their secretion, that callus is imperfectly formed. This is the reason why, in scorbutic constitutions, in men infected with syphilis, in pregnancy *, in fever, or in any great disorder of the system, or where the wound of a compound fracture is still open, no callus is generated †.

It results from this doctrine, that callus is established in a renewed continuity of vessels ; that a soft, flexible, and vascular substance is interposed betwixt the ends of the broken bones ; that a sort of tempo-

(* The opinion that pregnancy prevents the reunion of bone was not well founded.)

† A foot-note of Mr. Pott's is the best comment upon this assertion. " There is one circumstance relative to compound fracture which may, perhaps, be deemed worth noting, which is, that I do not remember ever to have seen it necessary to amputate a limb for a compound fracture, on account of the too great discharge, in which the fracture had been united. In all those cases where the operation has been found necessary, on account of the drain of matter, the fracture has always been perfectly loose and disunited.—Foot-note to POTT's Treatise on Fracture, p. 474.

rary gland is organized for the generation of bone, or, to speak not figuratively, but philosophically, it seems as if, by this reunion of all the adjoining parts, the original constitution and proper organization of a bone were restored. But for some time the secretion of earthy matter is imperfect; it is infant bone, soft, flexible, of an organization perfect for all the purposes of bone, but as yet delicate and unconfirmed; not a mere concrete, like a crystallization of a salt, which, if interrupted in the moment of forming, will never form; not liable to be discomposed by a slight accident, nor to be destroyed entirely even by a rude shock! Young and unformed callus is a substance soft and fleshy, so that it yields; ligamentous in its consistence, so that it is not very easily injured; and in its organization so far perfect, that when it is hurt, or the bony secretion interrupted, the breach soon heals like the adhesion of soft parts, and so the callus becomes again entire, and the process is immediately renewed.

Towards the end of the cure of a fractured limb, the patient becomes careless and confident, and often by his playing tricks with his crutches, or by the crutches slipping or breaking through his negligence, he loses his balance, throws all the weight of the body suddenly on the weak limb, and thus breaks it a second time. And here a phenomenon presents itself, which very strongly confirms our doctrine. It is, indeed, contrary to the vulgar opinion, but yet it is certainly true, that when a limb is broken a second time, it reunites more easily than at the first, and when broken a third and a fourth time, heals still faster and faster. A little girl, a daughter of Mr. Y. had her arm three times broken, and at each

time I found it unite in a shorter period than the preceding. A young man, a servant with Mr. G. having broken his leg, it bent and broke under him three successive times, and at each successive fracture it healed more and more easily.

“An officer whose leg had been reduced by a French surgeon, and who was recovered so as to walk abroad, fell and broke it a second time, about the fiftieth day of the cure. The limb being reduced and laid again in splints, was so well ossified in twelve days, that the surgeon took off the splints, the patient was able to lift his leg; it bore its own weight quite easily, and by the twentieth day it bore the weight of the body; he walked abroad, used all manner of freedom, and was cured a second time, and by the twenty-fourth day he was able to walk without any other help than a cane. But this ill-fated leg was destined to be broken a third time; for, this gentleman having mounted his horse in order to go and join his troop, the first step of his journey was a very disastrous one! His horse plunged in among some clay, he fell, and the horse, in kicking to clear himself, broke both the boot and the rider's leg. This third fracture was still more easily reunited than the second, for in less than six weeks he went to his regiment with the leg strong and firmly joined, and so accurately, that it was not easy to distinguish the broken leg from the sound one.”

Every accident of such a case is perfectly consistent with the doctrine which I have laid down, and proves it very strongly. Callus is really more vascular than bone, and of this we are assured by various proofs. Having cut off the limb of a soldier, whose leg had been broken in America twelve years before, I found,

upon injecting the bone, that while the bone itself received the red colour of the injection pretty freely, the callus, which goes in a zig-zag form, joining together the several ends and points of a very oblique fracture, was very singularly red. The callus, then, is more vascular than the bone which it belongs to, even at the distance of twelve years from its formation. This callus, unconfirmed at the time that it is broken, is soft, and very highly vascular. When the callus breaks, many of its vessels are ruptured, but some are only elongated, and it rarely happens that its whole substance is torn. You may easily imagine how much more readily the continuity of vessels will be renewed within the substance of the limb, when the bone or callus is surrounded by vascular parts ready to swell and close up the breach, than in any external wound. When we consider the perfect vascularity of a callus, its ligamentous toughness at the period of its being thus rudely bent, the excitement which must follow this partial rupture, and the full and vigorous circulation in vessels accustomed to the secretion of bone, we understand why a fractured callus is more speedily reunited than a broken bone, where nothing is prepared for the generation of new bone.

I think I cannot illustrate the condition of a callus, at the time that it is broken, better, than by comparing it with the condition of a bone, where, by the perpetual restlessness of the patient, a proper callus has been prevented, where the bones have covered themselves with a sort of cartilage, and an unnatural joint has been formed; where the surgeon makes an incision, turns out the ends of the bone, pares off the callus from each end of the bone, returns the pared ends of

the bone again into their place, and lays them among the flesh, opposite to each other, and sews up the wound! then adhesion takes place, the communion of vessels from bone to bone, and also the continuity of all the surrounding soft parts, is restored; then all the surrounding vessels are drawn into action, a mass of parts, active and in high circulation, is formed round the broken bone, the blood and humours are worked towards it, and the vessels of the bone itself being thus supported in their new action, the ossific process is renewed with great energy. This is the result of an experiment, or rather of an operation, which has been several times performed, and particularly by Mr. Park of Liverpool, and is a fine analogy for explaining the condition of a fractured callus; for in proportion as the organization is advanced, and the parts full of blood and in high excitement, the second fracture is more rapidly reunited than the first.

[I have no objection to the illustration; but this is a questionable point of practice. My brother performed this operation on the humerus. The time for the union of bone having passed, and a false joint having been formed, he made an incision upon the extremities of the bones, turned them out, sawed off their ends, reduced them, and successfully treated the case as compound fracture. But this is a severe operation, and not without danger in the thigh, besides, that very often it does not succeed; the suppurative process set up defeating the intention. It is, in these cases, proper to try the method by seton. A seton is passed through betwixt the ends of the bones, and it is permitted to remain weeks or months, until the false joint becomes stiff and painful; then

the limb is carefully put up in splints and secured. Some experience has, however, shown me another case of failure; the extremities of the broken bone sometimes waste to a mere point.]

This accident, of breaking the leg a second time, is in no case so grievous a misfortune as might be imagined; in a very ill reduced fracture, I should rather esteem it fortunate. It was the practice of surgeons in all ages, to snap the limb across their knee whenever they were ill pleased with the shape of it; and although, in the present day, such a practice would be esteemed a mark of the grossest ignorance, it is but one example out of ten thousand, where opinions which now pass only among the vulgar may be traced to the highest and most respectable authorities.

That the ancients had very generally engaged in this practice, I could easily prove by direct authority; but, indeed, there can be no proof more satisfactory than what is to be found in the writings of those who were averse to the practice. “When a limb is unfortunately so united that it is crooked, knotty, and deformed, but still useful, you must by no means hearken to the advice of *those who direct* you to break it a second time; a thing which has been but too much practised in these countries (viz. in Arabia) by foolish physicians and bone-setters. The operation is dangerous; it is even fatal.”

One should have believed Albucasis, from these manly and determined expressions, to have been quite above such follies. But he has a beam in his own eye, while he is plucking the mote out of his brother's; for this same Albucasis is full of directions for softening, for paring, for chiseling, for sawing,

and for rasping away exuberant callus, which sometimes he tries to soften, and sometimes to constrict by styptics. "Often," says Albucasis, "the callus, especially when near a joint, is knobby, deformed, and even causes lameness of the limb. Then you are to consider whether the callus be recent; then you use styptics, aloes, olibanum, myrrh, and accassia, and prepare them with wine, vinegar, or whites of eggs; bind such an astringent firmly over the lumpy callus, and renew this firm bandaging and these powerful astringents till the protuberance be dispelled; or bind round it plates of lead, for lead is a metal very friendly to the human body."

"If the callus have already concreted and become firm, and you be in haste to rid the limb of it, then make an incision, and rasp off the protruding part with saws."

When Albucasis directs these operations merely for exuberant callus, we may well wonder what kind of operations he has in reserve for a lame and distorted limb. He repeats the same process; he does not, indeed, direct astringents; those are used only to repress the sponginess of recent callus; the confirmed crookedness of a deformed limb is to be overcome by soaking it in emollient fomentations of melilot or mallows, or it is to be softened with the mucilage of mallows, oil of sesamum, and cock's grease. But his last hope seems to have been in the pigeon's dung, fat figs, and other medicines, termed among the Arabians, *Medicina Consolidationem Minuentes*, *Attenuating Medicines*, rubbed in with the warm hand; but if these failed, he who would by no means break the leg, directs his pupils, "if the distortion be old and firm, to cut across the bone, and

saw off all that is superabundant, whether of the bone or of the callus. "Study and practice," says Albucasis, "will make you very expert in the operation." Thus the prudent and sagacious Albucasis, who would by no means hear the advice of these ignorant physicians and bone-setters, who advise to break the leg and set it anew, describes in various places how to saw or scrape, or cut away with saws or chisels, any unsightly callus.

If Albucasis be more particularly to blame, it is because what others recommended only, he absolutely performed; but the doctrine was as old as the science of surgery itself. These operations are servilely copied from the ancients by many modern surgeons; they have transcribed the very words from Paulus. In no age have surgeons forsaken this operation. Fabricius has recommended the breaking the limb anew, and La Motte almost in our own times has practised it.

And in the next succeeding age, we find Heister not at all less explicit than Albucasis, Fabricius, or the ancients. He repeats verbatim the rules of Fabricius. He says, "This, however, is not to be done in the aged nor infirm, but where the callus is tender, and the patient young and vigorous, this operation may be fairly attempted *."

Men of the first eminence in our profession, the very best surgeons in the world have been in the practice of performing this operation. "I was called," says La Motte †, "to a young man of sixteen years of age who had the thigh bone broken seven or eight weeks before, and it was so reunited that he could not walk; the broken thigh bone was shorter by half

* Page 117.

† Page 193.

a foot than the sound one, and he called me in order to learn whether some sort of shoe might not be invented by which the leg might be raised so as to enable him to walk.

“ I found the bone broken about the middle of the thigh, the bones were so awkwardly joined that they absolutely crossed each other. There was a great elbow looking outwards, and a proportioned hollow within ; but the lad being young and healthy, and the callus as yet soft, I formed the resolution of setting the thigh bone again in its right shape by extension and counter-extension ; for I knew that the attempt could do the boy no harm, and I remembered, from the accidental breaking of the callus, that the callus was long of obtaining its perfect consistence. So having made his bed and prepared bandages and splints, I made a powerful extension, by the help of my young men, and pushed in this elbow with the flat palm of one hand, and resisted with the other. I succeeded perfectly to my mind, so that, without one cry from the lad, I reduced this angle, and made his fractured thigh as straight and as long as the other. In a month he was freed from his splints, and walked without pain or halting, while his thigh was as straight as an arrow *.”

There is a rudeness and boldness in these old practices which we dare not imitate ; yet these are facts of which no surgeon should be ignorant, and indeed it is a matter which should be seriously considered, whether an oblique fracture will not be more easily retained of its due length, after the bones are rounded with a callus, and the surrounding parts all

massed together, and so knotted by inflammation, as to support the edge of the bone, than when the fracture is recent, the broken ends of the bone naked and very sharp and pointed, cutting their way forwards among the lacerated flesh. It is to be considered whether La Motte did not accomplish, in this latter stage of the callus, what he could not have atchieved in the recent fracture. Does not his report also give us a sort of assurance that the pain will be less, even if we should venture to disunite an incipient callus, than when we extend a leg recently fractured and highly inflamed?

I know how strong the common prejudice is, and that these will hardly be received as conclusive proofs of callus being little injured by occasional motion. Notwithstanding the clear history of these facts which I have just delivered, it may be alleged, “that the wild and ignorant notions of Albucasis, or the learned and Gothic credulity of Fabricius, or even the rude and bold enterprises of La Motte and his contemporaries, are all but slender arguments for supporting a new doctrine.” But the doctrine stands not upon any ambiguous proofs. I could demonstrate to you, if it were worth your knowing, that every surgeon, from the days of *Celsus* downwards, had been in the practice of extending the leg, and so extending the callus and putting it right when at any time he thought it wrong. This unquestionably is true, that if a man will not suffer his limb to be at rest; if he will not refrain from carrying burdens though his arm be broken; or will not leave off working at his trade, though the radius and ulna be fractured! there is no question, that such incessant and violent motion will destroy, from time to time, all continuity of

vessels, and absolutely prevent the formation of a callus. But there is nothing more certain, than that the extending a callus gradually, regularly, and gently, from time to time, will not harm it.

FRACTURE OF THE THIGH BONE.

In the fracture of the thigh, where the muscles are powerful, and where all the ingenuity of the profession has never yet been able to prevent retraction and shortening of the limb, while some have put garters round the ankle and tied them to the foot of the bed to maintain a permanent extension, others have chosen to allow of that occasional contraction which they were sensible they could not entirely prevent, being careful only to renew the extension from time to time; and if those who judged in this manner had the boldness to extend the limb anew every day, or at every dressing, or every twelve hours, then we may be assured of one of two things, either that such extension does not injure those vessels which are gradually forming and perfecting the callus, or that a leg so maltreated could never reunite.

Mr. Foubert of the Royal Academy of Surgeons of France, laments the impossibility of keeping up any permanent extension on account of the excoriation, swelling, and intolerable pain which such bandages excite. He was sensible that he could not prevent the limb contracting, but he was careful to extend it from time to time. He laid his patient upon a hard and firm made bed; he put a napkin, or other bandage, under the pelvis and round the groin, by which an assistant made resistance (or

counter-extension, as it is called in technical language), while he himself extended the leg by a laque or bandage put round the ankle joint. The moment the limb was extended, the patient was relieved; but the relief lasting but for an hour, the limb contracted and required to be extended again; and Mr. Foubert *renewed this extension every twelve hours*, if necessary, for the first twenty days; but after the twelfth, fifteenth, or twentieth day, the callus becoming firmer, he found no longer any occasion for extending the limb *."

Parée, more rational and moderate in his manner of extending the leg, advises the surgeon to be careful at each dressing, that is, every third or fourth day, to compare the length of the broken limb with that of the sound one, and to be careful in extending and reducing the limb before the callus fixes, lest the patient should halt when cured†. I think there is even reason to believe, First, That in cases of desperate and oblique fractures, those limbs have been least deformed which have been most frequently broken. Second, That a limb ill set, fractured again by chance while the callus was soft, and set a second time, has been preserved more nearly of its due length than it could have been if set immediately after the accident, and allowed to heal without interruption. Third, There is also reason to believe, that those

* On est quelquefois obligé d'avoir recours au même procédé toutes les douzes heures, pendant les premiers jours du traitement; mais passé douze, quinze ou vingt jours on n'est plus aussi souvent dans cette nécessité.—FOUBERT, p. 645.

† Partant, faut à chaque fois qu'on l'habille avoir égard à la figure de l'os, et conferer la longueur de la jambe saine à celle du côté malade, et auparavant que le callus soit fait le tirer et reduire, en sort que le malade ne demeure boiteux, et que le malade se remue aussi le moins qu'il pourra.

surgeons who have used the permanent extension with most success, those I mean who have kept the leg continually extended by bandages fixed to the head and to the footboard of the bed, have succeeded, not as they imagined by supporting an unceasing tension of the leg to the same exact length for six weeks or two months! that were impossible! It seems to me more likely that the laques and bandages have relaxed from time to time, that the joints of the limb itself have yielded, that by this yielding the apparatus has been loosened, and the patient has lain more easy during the night, that the surgeon in the morning has extended the limb again, and regained by this new tension what had been lost during the afternoon and during sleep; and thus what authors have called a permanent extension, seems to me rather to consist in successive reductions of the limb like those of Mr. Foubert. I believe, therefore, that Mr. Foubert, who rejected these extending bandages as a useless cruelty, obtained exactly the same advantages by occasionally extending the leg, that those have done who have pretended to support a permanent extension. I am confirmed in this opinion by remarking that Heister, who used the bandages fixed to the head and foot of the bed, did not so much regard those bandages as means of permanent extension! He considered them rather as laques fixed for the purpose of occasional extension, and therefore he directs the limb "to be extended anew every time it contracts during the cure."

Those who, in consequence of accidents, have had their limbs set again from time to time (the bones having slipped past each other), have had the limb straighter and longer than those who have had the

limb set once for all, and not unbandaged till near the end of the cure. Those limbs also have been least shortened which have been set, and disturbed and set again. Thus Paræus, who did not believe that there was really such an accident as a fracture of the neck of the thigh bone, being called to an old lady who had, by a fall injured the haunch joint, found what he imagined to be a luxation. It was the shortening of the leg that made him imagine that the hip was luxated, and when he felt the great trochanter high upon the hip, he imagined that to be the head of the bone. He extended the limb till he thought he had pushed the head of the bone into its socket, and brought the two legs to be of equal length, and then applied his spica bandage. But two days after, upon visiting the lady, he found her complaining of great pain, and her leg was shortened again, and it was then only that the limb was properly set. This leg reduced at the distance of some days from the accident, and extended from time to time, was cured without shortening.

Hildanus, too, having set the thigh bone of a little girl of eight years of age, the thigh contracted again on the fourteenth day, the bones passed each other, and the thigh was shortened, yet this is the case in which Hildanus succeeded the best! He made a perfect cure; and indeed upon mentioning the cure, he breaks into solemn exclamations of thanksgiving, with many expressions of gratitude to Him that made us, which, even amidst his antique language, must, to a modern surgeon, seem particularly antiquated.

I hope that by these facts and reasonings I have sufficiently proved to you, not only that callus is

not a chemical process, an inorganic concrete, which being disturbed in its time of concretion will never form, but also that callus considered as the rudiments of new bone, though delicate, is flexible, and though it may be hurt by rudeness, cannot be destroyed ! That when the cure is interrupted, even by an entire fracture of the callus, the process is easily renewed ! that it is not every slight disturbance that will disappoint us of a cure ; that those accidental movements of a broken limb which alarm the patient, or even give him pain, and which he reports with great earnestness and anxiety to his surgeon, are yet of no importance. You perceive with how little reason the justly celebrated Dessault says, “That it is a principle *which will admit of no controversy*, that to effect the reunion of fractured bone nature requires, not merely that the fractured ends be approximated, but that the limb be *preserved in a state of absolute rest.*” This incontrovertible principle he makes the rule of all his practice, may I be allowed to say it, of all his cruelties ; for this he derides, (and forbids in the most absolute terms), the practice of laying out a limb easily upon a pillow. It is about the practice rather than the theory that I am apt to be concerned, and I doubt not you will be able to forsake the authority of a great name, wherever you feel yourselves supported by the paramount authority of reason and facts.

But what need is there of such proofs ? have not surgeons continued bandaging fractured legs with rollers, down to this very day ; and does not the surgeon every time that he rolls the limb, which is, by all the rules of surgery, every third day, does he not move the callus ? He would be a cunning surgeon

indeed who could cure a broken limb by rollers and splints, if a slight motion could discompose the callus. If then the old doctrine, of callus being easily discomposed, be so plainly a mistake, what can be more absurd than the old practice? While the reunion of vessels and generation of callus in a broken bone is so fairly analogous to the inosculation of vessels and the reunion of surfaces in an open wound, nothing will injure callus which will not hinder any other adhesion. Motion will not so easily affect an incipient callus (surrounded as it is with adhering parts), as the adhesion of a superficial wound, which has nothing but stitches or plasters to support the parts. Callus is not a juice! it is not an effusion from the ends of the broken bones! Callus has no analogy with molten lead! nor the setting of gypsum! nor the hardening of stalactites, nor any other concretion! Could motion discompose callus, as it prevents other concretions from hardening, no broken bone could ever heal.

From this history, you observe I draw no rash conclusions. I do not propose to break limbs when they are almost healed, that they may heal faster; nor to take even a crooked and unserviceable limb and lay it across the knee like La Motte; but I wish you to do what is to be done with a rational purpose.

First, See that you take measures to subdue the rising inflammation; bleed, or apply leeches; cover the extremity with a cold evaporating lotion; see that the limb is so far secured, that the patient shall not move it during sleep. He will be anxious to have his broken limb set; do you take care that you do not bandage it while the swelling is still increasing.

The swelling is moderate, or it has subsided; it

is usual to put on a piece of soap plaster ; the only intention of this is to prevent the skin being chafed by the splints. You see the limb rolled too in hospital practice ; this is for no other purpose than to give a gentle and general support to the limb, which has suffered some inflammation, and is liable to effusion ; the support is very agreeable to the patient's sensations. If there be any point where the skin is inflamed, or where there is danger of the bone projecting so as to inflame the skin, leave it uncovered, or manage the roller so that you can expose it without disturbing the limb. If you have occasion to cut up your roller, see that you do it in that fashion, that you can lay down the turns of the roller again in the manner of the eighteen-tailed bandage, without undoing the whole, or of displacing the limb.

Next, place your splint along the limb ; see on what point it bears, and then see that the splint is covered and soft. Observe too, that the straight splint cannot lie along the convexity and concavity of the limb ; pad up the vacuities betwixt the limb and the splint, so that it bear equally on the whole extent of the limb. Put on your tapes in a proper manner, and at intervals round the splints, and lay the whole upon a pillow. Lastly, Look well to the position of the hand or foot, and that neither by the shifting of the body of the patient, nor the gravitation of the extremity, any twist is insensibly taking place in the position of the fractured extremities.

After all that has been said in the history, it is your duty at all times to preserve the limb steady ; but if it be accidentally displaced, or becomes shorter by the action of the muscles, it may be extended

again and laid smooth, without fear of hurting the callus.

Dismiss, then, those anxieties about the manner of rolling, and the express degree of firmness which the bandages should have, look no longer thus anxiously at the points of the fingers or toes, to see whether the bandage presses properly so as to make those parts swell; you are not to draw the roller so as to straiten the limb up to the very point of producing gangrene, nor to use any bandages that are formidable from their straitness, nor any that are even firm, except in children, in drunken people, in maniacs, or in those who are delirious with fever or pain.

DEFINITIONS OF THE VARIOUS SPECIES OF FRACTURES.

Having corrected some prejudices, and initiated you into the history and theories of this interesting subject, I propose next to lay before you the various characters and distinctions of fractures. The formal distinctions of the schools we must endeavour to unlearn; for in the old surgery, fractures were distinguished rather by their form and other trivial accidents, than by the essential circumstances or peculiar dangers of the case. The ancients distinguished fractures into oblique, transverse, and longitudinal, according to the direction in which the bone chanced to be broken. They called a fracture *Incomplete*, when, of two bones, as the Radius and Ulna, one only was broken; *Complete*, as when both bones were broken, both Radius and Ulna, or Tibia and Fibula, or where there being but one bone, as in the arm or thigh, that bone was broken. They called a fracture *Simple* where there

was no wound of the skin, and apparently no splinters of bone ; and they called it Comminuted Fracture, when, though the skin was still entire, it could be perceived by handling the member that the bone was broken, or as they chose to speak, comminuted, crushed into small pieces. This was what Duverney called compound fracture. But I would allow of no distinctions so trivial, so perplexing, savouring so much more of learning than of knowledge. I would have useful practical distinctions, or none. These distinctions of the old surgeons were made at a period when men delighted in no other kind of learning ; they have no relation to the treatment of any case, and should not occupy a mind, which should be filled with more important considerations ; for there are certain peculiarities in each case which determine the safety or danger of the patient, and even the peculiar treatment ; and these are, doubtless, the circumstances you should learn to dwell upon.

First, *Simple fracture* is that in which the bones, though broken, do not protrude. The soft parts, though inwardly torn, are but little injured. The periosteum is not separated in any remarkable degree from the bone ; but the periosteum clings to the bone, the tendons and muscles to the periosteum, and the surrounding soft parts are so compressed around the fracture, in consequence of the limb being entire, that adhesion soon takes place among them ! The interstices are filled with a gelatinous effusion which soon becomes organic, and the continuity of vessels is immediately restored. Even in a comminuted fracture, each little piece of bone retains its connexion with the soft parts, and lives, and is nourished, and reunited with the bone to which it

belongs, so that when we dissect a fractured bone in the first days, we find the periosteum thickened like soaked shammy leather, the soft parts massed together by inflammation, and the secretion of bone beginning in separate points ; and when we dissect an old fracture, we find little pieces and splinters perfectly consolidated into the callus which had been entirely separated from the bone. This case, then, requires nothing but ease and quiet, and a favourable posture of the part. The cure may be resembled to the adhesion of an open wound where there is immediate reunion of vessels, no suppuration, no waste of parts, no remaining mark of injury, there is a spontaneous and perfect cure. The cure is spontaneous, the work of nature alone ! the surgeon has nothing to care for but the form of the limb, to lay it even at first, and to redress its posture when it happens to be disordered.

Secondly, Compound fracture is that where the fracture is accompanied with an outward wound, and it is called Great Compound Fracture when the bone protrudes. And in this case the flesh is often cruelly mangled, and the bone shattered into many pieces, and yet the parts retain (though not always) their life and vigour. The protrusion of the bone makes a rude and lacerated cut ; the soft parts, as the periosteum, muscles, and skin, are all cruelly mangled, but they are not destroyed ; the periosteum still clings to the bone, the muscles to the periosteum, and the skin to the muscles ; there is a very shocking outward injury, but there is happily no proportionate disorder of the inward parts. The inward parts are lacerated and wounded by the protruding bone ; they are hurt by the violence (as the crushing of a chariot wheel)

which caused that protrusion ; but they are still alive, still adhere to each other, and give mutual support ; no part is so entirely killed, as by its death to draw on the death of the whole. But then these parts, though not killed nor separated from each other, are so torn that they seldom reunite ; they run into inflammation, and the cellular substance is so filled with extravasated fluids, and the bones so crushed, and reunite with so much difficulty, that the suppuration is very profuse.

There are two periods of danger in compound fracture ; first, during the extent and violence of the inflammation of the first days, and the extent of suppuration in the second period. The heaviest responsibility falls on the surgeon in desperate cases of compound fracture. If amputation should be required, and the time is let pass, the patient may die of the violence of the inflammation ; swelling and gorging of the limb, and mortification may follow so fast, that you cannot amputate. If the patient should survive the first violent inflammation, he has to undergo other sufferings, pain, fever, and profuse and deep suppurations. If he survive this, then the lax swelling subsides ; the suppuration lessens in quantity ; the loose bones are discharged ; the living bones (whose periosteum still adheres to them), though broken in a way seemingly destructive of all organization, recover their connexion with the fractured bone, in a manner which has long been admired. Of the bruised parts, those which lie deep come to be pressed into contact with each other ; the vacant spaces within and the external wound are filled with granulations, and then the continuity of vessels is restored, and the callus is completed. This continuity of the vessels is essential

to the regeneration of the bone ; and we see the reason of a phenomenon which has excited the surprise, not only of Dr. Hunter, but of all surgical writers from time immemorial, viz. that during the suppuration, and while the wound continues open, no callus, or at least, no complete callus, ever forms.

Thirdly, In compound fracture and luxation, where, along with the protrusion of the bones, there is a laceration of ligaments, tendons, and capsule of some great joint, the case is peculiarly dangerous. When, for example, the ankle joint is burst up, the astragalus broken to pieces, or turned out through the wound, the lower end of the tibia shattered and protruded, and the fibula also broken, the disorder is such as to defy the powers of nature, and art can do but little. This is of all cases the most perplexing to the judgment, and distressing to the feelings of the surgeon, who often wavers in fear and anxiety, for some days desirous of saving the limb, and yet fearful of losing the patient's life, till at last the fatal gangrene appears, and he feels most poignantly the fault he has committed, if, indeed, the surgeon can be said to have committed a fault who has attempted to save a man's limb, though at the risk of his life. Yet the surgeon, though he have acted deliberately, conscientiously, sensibly, and humanely ; though he has been supported by the countenance of his fellow surgeons ; still, when misfortune comes, must feel himself unhappy.

The French surgeons, with one accord, declared amputation to be in such cases the only chance of saving the life. Palfin says*, “ In luxations of the

anle, there is seldom any thing to be done but amputation." The same is laid down by Duverney *, as an express unconditional rule of practice. We do not comply with any such barbarous rule, we take it only as a denunciation of the danger which is observed to attend this particular case ; we keep our minds free and unbiassed, so that we may be able to decide this question according to the circumstances. We know that nature will do wonders, but they are wonders, and we never enter upon the attempt of preserving a limb thus desperately fractured, without awful hesitation, and when we do venture to dilate the wound, and push back the bones, or saw them off, we feel all the responsibility of what we have just done. We watch the appearance of mortification for some days, and wait with inexpressible anxiety the natural issue of the case, life or death, trying by every means in our power to prevent the violent inflammation from getting head.

Thus the simple fracture terminates in adhesion of the parts inwardly bruised and injured ; compound fracture ends sometimes in adhesion, but more frequently in suppuration of parts too much bruised to adhere ; but the fracture of a great joint, as of the anle, is attended with lacerations too terrible to adhere, or even to suppurate easily ; this is the case which, while it sometimes suppurates, is most apt to terminate in gangrene and death.

In compound fracture, and gunshot fracture, you must find means of keeping the limb steady without danger of compressing, or binding it tight ; for when the ends of the fractured bones are jagged and loose,

every motion is accompanied with a new injury of the surrounding parts. You must provide, at the same time, for the inspection and dressing of the wound, and the colour and condition of the integument must not be concealed. For these objects, it is usual to place a fractured thigh or leg in *junks*, and they are applied in this manner:—A sheet is spread out and folded in a square form, and of extent to reach from the groin to the heel. As much long straw as you can grasp with the hand is put down on the two opposing margins of the sheet, and the edges of the sheet are rolled over the straw, so as to form two long bundles. The sheet, thus prepared, is kept under the fractured limb, without disturbing it, and then the *junks*, or bundles, are rolled towards the leg, until they are brought up to it and parallel with it. Then the portions of a bandage, laid double, are passed under the limb and the *junks*, and so being brought round, they enable us to draw the limb and the *junks* together; so that the fractured bones are kept straight by the *junks* lying on each side of it, and without hurting the limb in its tender condition, or in any way interrupting the circulation.

With this simple apparatus, fomentations or lotions may be applied, abscesses may be opened, and dressings changed, merely by undoing the ligatures, and rolling back the *junks*, and reapplying them. The *junks* answer very well to carry a broken limb in, when the patient must be moved.

Fourthly, Gunshot fracture has many dangers peculiar to itself; and of all those circumstances by which, in other fractures, the soft parts recover their healthy condition, and the splinters regain their

natural connexion with the bone, not one can take place in gunshot wound. For here there is loss of substance! the bone is not merely broken, it is destroyed, contused, and deadened by the blow, and condemned to the absolute exfoliation of every individual particle and splinter that has been shaken by the ball.

From the moment in which the bone is struck by a ball, it loses its life and circulation, and all its connexions with the soft parts. The bone is deadened to some extent by the force of the blow; it is splintered into many pieces; the periosteum, too, is killed by the shot; so that of the injured or splintered pieces, not one can recover its life, or resume its connexion with the living system.

Nor is the bone only killed, but all the surrounding parts also, for the bone is the resisting body which, by receiving the force of the ball, reverberates it upon the adjacent parts, so that that portion of the flesh which most immediately surrounds the bone is particularly affected, is deadened, and thrown out in the form of sloughs.

These are the accidents of this species of fracture, which distinguish it from all others; for the death of all the internal parts insulates the broken bone. There can be no adhesion among parts which are actually dead, the continuity of contused vessels can in no shape be restored; instead of a knotting of the soft parts into a vascular mass, full of life and action, supported by a continuity of vessels, and fitted for the generation of callus! there is a cavity full of foetid matter, dead and sloughing flesh, and insulated fragments of bone! a narrow opening, a deep and ill-conditioned wound, and a profusion of foul and

putrid ichor flowing from the narrow openings, or bursting through various fistulas from time to time.

Thus, a gunshot wound with a great fracture, resembles in many points the worst kind of caries. The detached bones are discharged with difficulty; the dead parts which have sloughed off, are very slowly replaced; it is long before the wound begins to heal from the bottom, or, in other terms, before the continuity of vessels is restored, or the mass of vascular substance prepared, in which the callus is to be formed. In short, the parts are with difficulty regenerated; they are slow to heal; apt to run into ulcers, fistulas, and collections of matter; while the patient is exhausted by pain, fever, and profuse discharge.

Having thus explained to you the general nature of a gunshot fracture, I believe you can be at no loss to imagine the peculiar difficulties of each case; for where the limb that is wounded is small, there is less destruction of parts; the sloughing is not great, the suppuration is slight, and the bones being near the surface, the shattered fragments are easily discharged. Thus it is in wounds of the radius and ulna, and of the os humeri.

But where the bone is greater, the mass of soft parts more bulky, the wound of course deep, and the destruction of parts proportionably great, the matter is apt to insinuate itself among the muscles, to insulate the bones, and to make, in the end, crooked and fistulous passages, and an almost incurable sore. Such are often the consequences when the bones of the leg are broken, especially where the joints of the ankle or knee are concerned.

But where the bone is the largest in the body, and covered with a great thickness of flesh, as in the thigh, there is a very extensive destruction of parts, the mass of disease is very great, and if the patient escape gangrene in the first days of the wound, he generally perishes afterwards from the fever, the incessant suffering, and profuse discharge. From a gunshot wound in the haunch bone, or in the femur, near its neck, about the trochanters, or any where high in the bone, the ball lodging, and the bone carious, not one of twenty escapes. The sufferings of such a person may be easily imagined, since he lives, or rather one might say, continues dying for five years ; and while he lies on this bed of torture, with matter running in profusion from various fistulas every where surrounding the joint ! irregular callus shoots out in fantastic forms round the bone, so as to unite the bones in that crooked form in which he lies ; yet even while the callus is thus forming, the fistulas being incurable, and the discharge profuse, when amputation is permitted it may be too late. He may be too much reduced, or there may be no room for leaving a stump free of the sinuses, carious bones, or sloughings.

[There is in the latter part of this chapter some things too strongly expressed. The moment that a bone is struck by a ball, it is not dead. I have seen twenty instances of musket-balls flattened on the skull, without producing exfoliation even. And I have repeatedly seen the femur, tibia, humerus, scapula, &c. split by balls, without the separation of a dead portion. That a ball, by striking a bone, will deaden it, there is no doubt ; but it by no means

necessarily follows, that because struck, it must die or exfoliate.

That gunshot fracture comes, in very many instances, to present an appearance like the worst kind of caries, is also true : but this is very principally owing to the confinement of matter, the want of free incisions, and the want of care in discharging the deep abscesses. While an abscess is permitted to exist, with any degree of restraint on the evacuation of the pus, no favourable change need be looked for in the condition of the bones ; on the contrary, they die, and become loose, and are a new source of irritation.]

DISCOURSE II.

ON THE ANATOMY AND ACCIDENTS OF THE HIP JOINT.

“ In mirabili articulatione femoris Creatorem adoramus.”

BOERHAAVE.

It is not alone on account of the lameness and misery which so often follow injuries of the hip, that we take a lively interest in the subject. There are difficulties in distinguishing the various affections of this deep lying joint, degrading to surgery ; every individual feels at times as if he were alone responsible for the general ignorance, and accountable for that lameness which is declared to be inevitable. They are difficulties which all ranks of our profession

complain of, which I cannot but feel, yet it is the subject which I must now endeavour to explain.

To what cause shall we ascribe this uncertainty? Surely to careless studies and indifference to anatomy, to ignorance of the form, or, at least, to an imperfect conception of the nature of the joint. Many have been made unhappy for life by this prepossession, as criminal, almost, as it is ignorant, “that to distinguish the disorders of this joint is impossible; that to feel for its injuries is an unmeaning cruelty; in one word, that lameness is inevitable!” Formal, scholastic, unmeaning distinctions have been long repeated as substantial knowledge; and explanations, which have no relation to the structure of the joint itself, praised as important theories. The joint has been described as composed merely of bones, and well are they who understand even the bones! but to consider it as a compound articulation, to regard the bones as endowed with living powers, as parts formed and supported by vessels, growing along with the body, and, like the rest of the body, subject to decay and injury! to observe the soft and glandular parts which facilitate the motions of the joint, and to regard the whole, the bones, periosteum, ligaments, and glands, as alive, subject to the usual changes of the living body, and to all the varieties of disease! is a flight beyond the usual education in philosophy of young men who learn merely the form of the naked shaft and processes of the bone, and know nothing of the living properties of the bone, of that system of active vessels within itself, or of vascular connexion with the surrounding parts, which can alone explain the nature of its diseases.

There are, no doubt, cases in which the errors of the surgeon are more immediately fatal than in the injuries of the hip joint, but in none do his mistakes render the patient so truly unhappy. If a bruise of this joint be neglected, if a luxation be misunderstood, the patient becomes irrecoverably lame, and every day of his life he is reminded of his misfortune by pain and fatigue. We observe numbers in the street whom we pity, even from the apprehension of what they suffer ; perhaps many of those might have been saved from this mortifying and miserable situation ; surely the frequency of this kind of lameness should be alarming to every surgeon.

If there be any subject universally acknowledged to be at once interesting and difficult, or upon which we should naturally enter with an impression of its importance, it is this. The natural connexions of anatomy and pathology, of cause and effect, will, I believe, appear more and more obvious and important as we proceed in the inquiry ; yet it is a subject which should be opened with the most perfect simplicity, and on this account I bespeak your attention to the following description of the hip joint. The student may be insensible to the value of this lesson, but the established surgeon soon begins to count his years by his disappointments, and those who have had the most experience will be the most ready to acknowledge how frequently and how unhappily they have struggled against those very difficulties which are the chief subject of this discourse.

GENERAL ANATOMY OF THE HIP JOINT.

The hip joint has to bear the whole weight of the body, and of occasional loads, nor is there any joint in all the body (not even the vertebræ of the neck, nor the hinge of the knee itself excepted) which has a more continual motion. There is no turn of the limbs, nor inclination of the body, which does not produce a corresponding motion in this joint. When the body being erect we bend the trunk, there seems to be a motion in the vertebræ, while it is merely the pelvis rolling upon the top of the thigh bone. When we turn the toe even in the slightest degree inwards or outwards, though there seems to be a motion in the foot, there is actually none ; the ankle and knee are rigid, and the corresponding movement is at the top of the thigh*. Even when we lie along in bed, there is no movement of the limb, no inclination nor change of posture in the body, however slight, which does not affect this joint ; those who have the hip joint injured, lie as still as in the grave. In short, the slightest motion of any part of the body moves this central articulation, and produces the most horrid pain ; the pelvis, in the ordinary motions of walking, rolls continually upon the top of the thigh bone ; and those who have the thigh bone displaced from its socket, in whom the weight of the body is not supported by the bone, but hangs by the soft parts, feel how entirely this joint supports the weight of the trunk, and is, as it were, the centre of all its motions.

* This is a manner of stating the argument that exposes the author to criticism ; nobody has more fully explained that the foot is loose when pointed, firm when at a right angle with the leg.

The knee does, indeed, like the hip joint, support the whole weight of the body, and equals it in strength and firmness ; the knee is also secured by strong internal ligaments, and is lubricated with many mucous ducts, but it has only one motion to perform ; it is a mere hinge ; it bends, but does not turn. In short, no joint of the body is at once so large, so firm, so steady, and yet so free in its motions, as that of the hip ; the knee and ankle joints support the whole weight of the body, but they are merely hinge joints, moving only backwards and forwards ; the hip joint alone, while it bears the whole weight of the body, moves, at the same time, in all possible directions ; and yet its movements, though continual, are so easily performed, that we are insensible of them till the joint is inflamed, when every motion gives excruciating pain ! or till it is ankylosed, when not only the limb is distorted, but the whole person deformed !

In the shoulder, the glenoid cavity or socket for the bone is shallow, the head of the bone is flat, there is no neck joining the head to the shaft of the bone, and the capsule of the joint is extremely thin ; it merely contains the lubricating liquor, but adds nothing to the strength of the joint. In the knee the heads of the bones are absolutely flat, and are merely laid upon each other ; there is no socket for receiving a round head, nor head to be so received ; the capsule of the joint is transparent at the sides of the patella, and as delicate in all its circle as a common bursa mucosa ; while the internal ligaments are placed not in the centre of the joint, but at the back of it, for it is merely a hinge, whose internal ligaments regulate only its flexion and extension. But

in the hip joint, all the provisions for firm, steady, and, at the same time, easy motion, are very perfect ; thus,—

I. The acetabulum, or socket for the thigh bone, is deep, large, circular, very solid, hollowed out of the largest bone of the pelvis, which is, of course, the largest and steadiest bone of the trunk ; while the head of the thigh bone is very big, of a regularly spherical form, and is inserted deep into this socket, the whole head of the bone being covered by the cartilaginous borders of the acetabulum.

II. The thigh bone is the only bone in the body which has properly a neck, which is long and oblique, and sets off the shaft of the bone from the socket, so that the high shoulders of the thigh bone do not, even in its widest motions, encounter the back of the haunch bone. The shoulders or processes of the thigh bone, named trochanters, are very large, to receive many powerful muscles which are implanted into them for the purpose of managing and turning the limb ; and these rotatory muscles turn the thigh bone upon its axis, preparing the limb for every new step, steadying it when the step is made, or bending and inclining the trunk upon the top of the thigh bone, when the limb is fixed by the weight of the body.

III. The capsule of this joint is singularly firm, it does not merely contain the synovia, but gives strength to the joint ; while other capsules are as thin as air-bubbles, this is in some parts nearly half an inch in thickness, hard and firm ; it is, indeed, at its fore part almost cartilaginous ! and it needs to be thus firm, for the long neck of the thigh bone prevents the great muscles being implanted (as in

the os humeri) close upon the head of the bone, so as to support the capsule.

IV. The central ligament is truly in the centre of this joint; it arises from the bottom of the socket, and is implanted into the head of the thigh bone; it is strong and firm, and holds the bone firm in its place; for this is a joint which moves freely, all its motions are rotatory, and this ligament is in the very centre of its circular motions.

V. The mucous fimbriæ, which lubricate the bones to facilitate their motions, lurk in the centre, or rather in the lowest part in the bottom of the socket; they are naturally connected with the central ligament, they are grouped round the root of it, and, of course, are moved with every motion of the joint, giving out their mucus in proportion to the degree of motion.

OF THE ACETABULUM OR SOCKET.

The acetabulum, or socket for the thigh bone, is formed in the centre of the greatest and firmest bone of the pelvis, named os innominatum, from its irregular shape. It is in the adult the largest and firmest bone of the pelvis, but in the child it is formed of three distinct bones, the Ilium, Ischium, and Pubis. These are joined by an intermediate cartilage, and are easily separated into distinct bones. At an early age this cartilage is prominent, and somewhat of a triangular form. The cartilage is ossified in the adult, and it being ossified becomes more prominent, and makes a high triangular projection in the centre of the socket; this prominence gives a firmer con-

nexion to that thin cartilage which lines, in a more general manner, the cavity of the socket ; it is here, also, at this prominence in the centre of the socket, that the central ligament is fixed, which, although it is named the round ligament, is (especially at its root) of a triangular form. The bones, which compose the acetabulum, are not inseparably joined even at the twentieth year ; it has been affirmed, that by a violent blow on the trochanter, driving the head down into the acetabulum, those three bones have been burst asunder ! I strongly suspect that it is the imperfect ossification in the centre of this joint that makes the acetabulum so often in boys the seat of disease.

The socket is of a fair circular or cymbal-like shape ; from its resemblance to a small cup in which vinegar was measured by the ancients, it is named acetabulum ; it is deep, and entirely receives the head of the thigh bone ; its borders are cartilaginous, project beyond the bone, and deepen the cavity. Its upper part, where it is formed by the Os Ilium, is both the deepest and the strongest part of the socket. Here the thigh bone is deeply lodged ; upon this point, in the perpendicular posture of the body, the whole weight of the body rests and moves ; and when a person falls from a height, and lights perpendicular on the feet, the weight of the body, the impulse of the fall, the additional weight of a burden (if the person is loaded), bears altogether upon the neck of the thigh bone, and it breaks across.

The lower border of the acetabulum is very differently formed ; at the lower part of the socket no weight is sustained ; the head of the thigh bone is

very superficially lodged; the socket is not even formed of bone, but there is a gap in this part of it filled up merely by ligament. It is necessary that so large a joint should have a lubricating apparatus, it is necessary, also, that the lubricating fimbriæ should be liberally supplied with blood-vessels, and this is the opening in the socket at which vessels can most conveniently enter free from the pressure of the bones. For this reason there is an opening in the lower part of the socket, which looks towards the Pubis and Thyroid hole; the bone is deficient for some space; a cartilaginous ligament supplies the place of bone, and the vessels creep under the ligament into the bottom of the socket. It is from this necessary defect of the socket that luxation downwards, though not more frequent than luxation upwards, is produced by slighter causes.

OF THE HEAD OF THE THIGH BONE.

The head of the thigh bone is quite peculiar in its form, and is the only true example in the human body of the ball and socket joint; for the head of the humerus, though circular, is a small segment of a very large circle, while that of the thigh bone is a very large segment of a very small circle; the head of the shoulder bone has less than one third of a circle, the head of the thigh bone has more than two; in short, the one has the properties of a flat surface, the other of a completely circular head received into a cavity proportionably deep. The head of the shoulder bone is merely laid flat upon its glenoid cavity, while the head of the thigh bone is

entirely received within its acetabulum, so that the borders of the cavity touch its neck.

The neck of the thigh bone is in all respects the most important part. The peculiar length of the neck of the thigh bone is essential to the free motion of the joint; it sets off the trochanters from the sides of the pelvis, and allows the shaft of the bone to turn freely. The neck of the femur is the only bone which bears its burden in an oblique and unfavourable direction, and it is placed obliquely, that each thigh bone may alternately bear its just share of the general weight. When we stand up, the neck of each thigh bone bears its weight obliquely in a less favourable direction, but then each thigh is equally loaded. When we move, when we make a step and incline the weight of the whole body upon one thigh bone, this thigh bone stands in a new posture with regard to the trunk and pelvis, the head of the bone looks directly upwards, and the neck of the bone is almost in the direction of the shaft; but so curiously does the angle of the neck change with the posture of the body, that in proportion as the weight of the body is inclined to one or other side, the neck of that thigh bone, which bears a greater proportion of the weight, comes more into the direction of the axis of the body. The neck of the thigh bone, while it bears its weight obliquely, is at the same time the smallest, the weakest, and, in all respects, the most imperfect part of the bone.

The head of the thigh bone is united with the neck by an intermediate cartilage; the head and neck are not firmly united till the twentieth year; and sometimes, in boys, the head is separated by

violence from the neck of the bone, producing a kind of fracture, named by the French authors *Decollément*. More frequently it happens, that the fracture is in the neck itself, especially in old people, for the neck of the thigh bone becomes thin at the approach of old age. But in the prime of life, when the thigh bone is broken with great violence, the fracture consists neither in a separation of the head from the neck, nor in a transverse fracture of the neck itself, but often the very thickest part of the bone, the root of the trochanters is broken so as to make necessarily a very irregular and clumsy callus.

OF THE CAPSULE.

The capsule of the hip joint is at once delicate and strong, delicate in its internal surface or lamella, but very strong in its external lamella. There is a reduplication of the membrane lining the socket, which it is of some importance to remark, for it appears to me, that this capsule consists of two lamellæ, of the membrane lining the socket, and of that which covers the haunch bone, both meeting at the edges of the acetabulum, so as to unite there. Of these two lamellæ, the outer one is singularly firm, thick, and hard, it proceeds from the external periosteum, is strengthened by adventitious ligaments, and especially by a band of ligament which descends from the lower spinous process of the Os Ilium; the tendon of the rectus femoris also takes its origin from the fore part of the capsule, and the capsule is at that part singularly thick, indeed it is hardly at

any part of its circumference less than half an inch in thickness, and is of a gristly hardness, so that it crashes when cut with the scissors or knife. The inner lamellæ, again, is quite different; it is exceedingly delicate, it lines the socket, and is reflected from the bottom of the socket over the central ligament, from which it expands again over the head of the thigh bone, covering that smooth cartilage with which the head of the bone is coated; it descends again along the neck of the thigh bone, and there this fine and delicate covering hangs somewhat looser, and we observe a sort of villi about the neck of the thigh bone, formed by the looseness of this inner membrane. From the root of the neck it again joins the thick capsule, so that this delicate internal lamella is at once the lining of the acetabulum, the covering for the head of the thigh bone, the covering, also, of the round ligament which unites the head of the thigh bone to the centre of the acetabulum, and the general lining of the capsule. This inner membrane is thin, soft, delicate, and at many places (especially where it covers the neck of the thigh bone, and the root of the central ligament) has all the appearance of a villous coat; it is, indeed, the villous coat of the joint, it is the secreting surface; for though we consider the fatty mucous ducts lying in the bottom of the joint as secreting an important part of the synovia, yet there is not the smallest doubt that the greater proportion of that liquor, and all that fluid which we find in dropsical joints, is merely a secretion from the exhalent arteries of this loose, villous, internal lamella of the capsule.

This continuity of the internal membrane of a

joint, is like that of the loose pericardium with the immediate epithelion or delicate covering of the heart itself; and as the fat and the coronary arteries of the heart are covered by that delicate inflection of the pericardium, so are the *pellotons* of fat, and the mucous fimbriæ which lurk in the hollow parts of joints, covered with this membrane; it is the continuity of this membrane which connects all these surfaces in their diseases. When the head of the thigh bone is luxated and replaced again, the central ligament is burst, but from the continual movements of the joint, the broken ends of the ligament cannot adhere again; it shrinks, therefore, to the bottom of the socket, and heals; but often the lining of the socket and the root of the ligament are so thickened by inflammation, that the head of the luxated thigh bone, though it moves securely in its socket, is a little raised. These membranes, which involve the bones, although pale and bloodless, are so vascular, that after laceration they always inflame, and often adhere; and so entirely is the head of the thigh bone nourished and supported by this inverted membrane, that when the neck of the bone is broken away, and the head left in the socket, the head, though apparently insulated, and left hanging by its central ligament, lives, shows strong ossifying powers, and often adheres perfectly to the inner surface of the socket; then the socket and the head of the Os Femoris become one inseparable mass of bone; and being thus united together, their ossific power is so strong, that they generate a large mass of callus; and the upper broken end of the thigh bone resting upon this broad mass of ossifying bone (composed partly

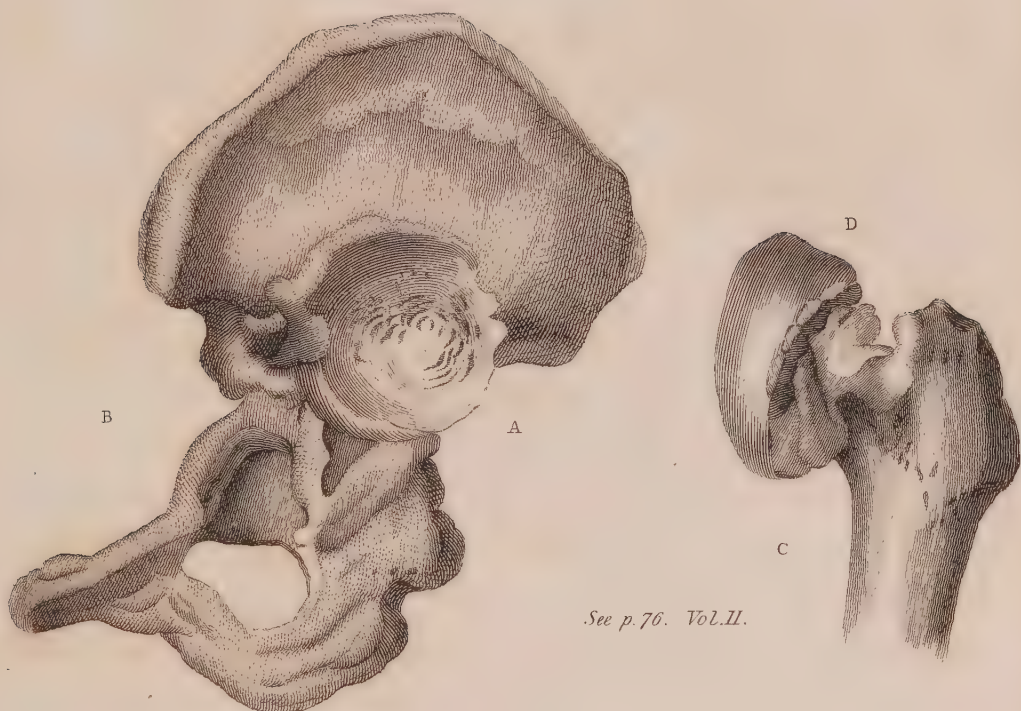
of the acetabulum, partly of the fractured head of the thigh bone), gives it, by its pressure, a shape conformable to its own, and thus makes a broad but imperfect joint*.

This continuity of the nourishing membrane of the bones is the reason of their being connected in disease; and it rarely happens that the head of the thigh bone is affected with caries while the socket remains sound; but wherever this ulcer begins (for it is as truly an ulcer as any open sore in the flesh), the disease extends itself from the head of the bone to the socket, and from the socket over the back of the os innominatum.

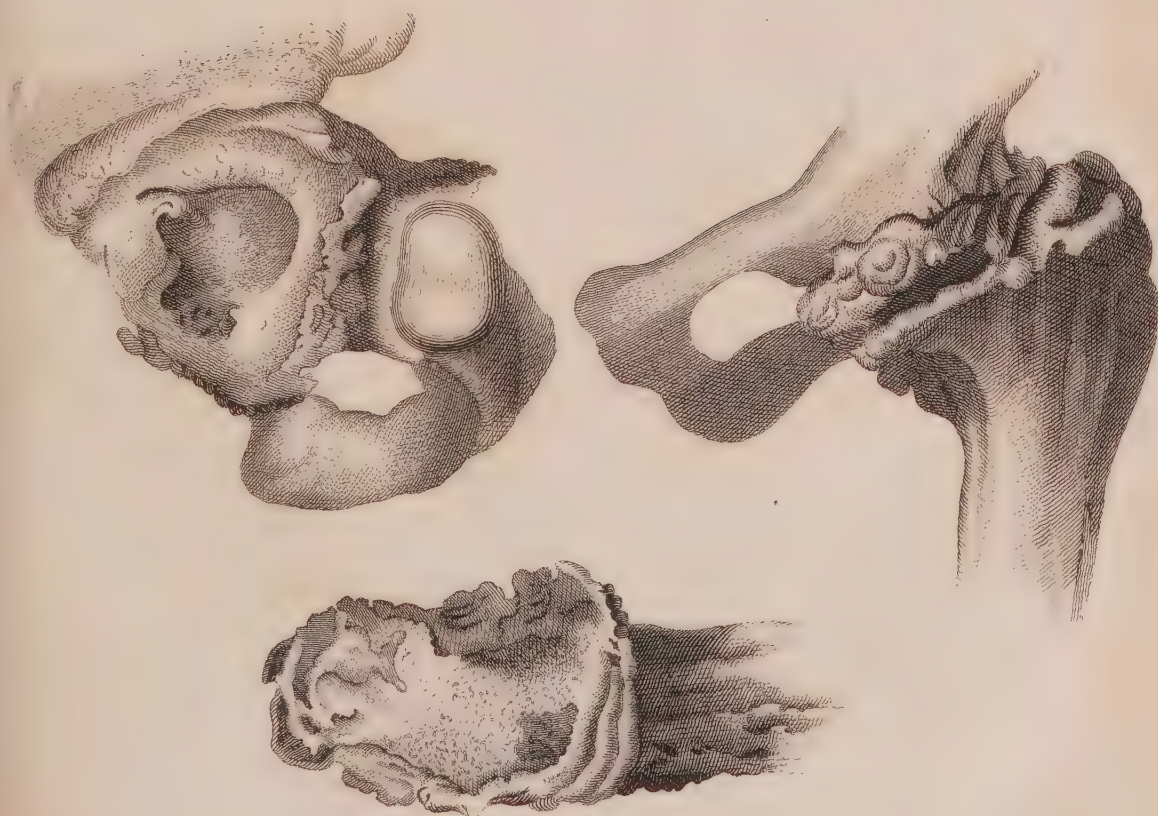
It is this life of the bone, supported by the nourishing membranes, that approximates the diseases of the bones and joints to the diseases of the soft parts; in ulcer, for example, of the soft parts, while one surface is extenuated by ulceration, the adjacent parts are swelled by inflammation, or protrude in the form of fungous flesh; in like manner, while one

* “Os innominatum et femur sinistri lateris, utrumque post fracturam colli femoris insolito plane modo degeneratum.”—Sandifort.

This union of the fractured head of the thigh bone with its inflamed acetabulum, is far from being uncommon. The annexed plate represents one from the museum of Leyden. The following description from Ludwig, page 373, conveys the idea as fairly as ever a drawing could do. “Femur cum osse innominato dextri lateris ex juvene circiter octodecim annorum nunc coram intuemur, in quo cristæ ilium et condylorum ossis femoris epiphyses, adhuc separatæ sunt, trochanteres autem major et minor jam prorsus coaluerunt. Epiphysis capitis a collo separata acetabulo accrevit, non tamen integra, sed hinc inde carie adesa, et superficie acetabuli interna aspera reddita; collum femoris, breve, inæquale, ita quidem in parte inferiore elevatum est, ut superficiem, capitulo quodam modo analogam, sistat, cartilagine tamen non incrustatam, sed tantum nonnihil lævigatam.”



See p. 76. Vol.II.



See p. 56. Vol.II.

surface of a bone is wasted by caries, which is an ulcer of the bone, another is swelled into the form of exostosis, which is a fungus of the bone.

This action and living power in those parts (so hard and apparently so insensible) is the reason why, when the two inflamed surfaces of the bone meet with each other, they unite with continuity of vessels; those continuous vessels support one another in their action, and secrete bone sometimes sparingly, and sometimes in great profusion, so that the two bones are united by a true vascular growth, not by a mere inorganic effusion, soldering the bones together; this is the nature of that concretion of bones which we call anchylosis, where the continuity of vessels is such, that the anatomist, by injecting the vessels of the one bone, injects the other through the intermediate callus*.

OF THE FATTY FIMBRIÆ.

The only parts which we are entitled to describe as the lubricating apparatus of the joint, are the fatty fimbriæ which lie in the bottom of the socket, although the *glandula innominata galeni* continued, for Galen's sake, to be described by the early anatomists, and that as confidently as if they had been

* The drawing represents one of the most singular accidents; the neck of the thigh bone was broken, the head remained within the socket, the head of the thigh bone and its acetabulum both inflamed, united, and became one piece of bone; and this new bony surface, which was four inches in breadth, was flat and smooth, formed a flat articular surface for the upper part of the thigh bone to rest upon; the upper part of the thigh bone remarkably enlarged and flattened, is also represented. Observe then, that in this case, the head of the thigh bone broken from its shaft, had no source of nourishment but its central ligament and investing membrane.

able to demonstrate a distinct and appropriate gland. But there is no such thing ; there is no formal gland ; there is nothing which we can certainly pronounce to be glandular. There are indeed certain fringes and fimbria surrounded with fat, manifestly secreting a lubricating mucus, which can be squeezed out from them ; but this mucus bears no proportion to the quantity that is required for the easy motion of the joint ; the synovia smegma or lubricating liquor with which the joint is bedewed, is a general secretion from all the surfaces of the joint, in which those fatty fimbriæ which lie at the bottom of the socket, or hang round the neck of the thigh bone, have but a small share ; yet these fimbriæ, being undeniably the most delicate part of the joint, deserve particular notice.

The fatty fimbriæ lurk at the bottom of the socket in a sort of hollow, formed by a projection of the ischium at that place in the bottom of the socket where the ischium ilium and pubis are joined ; there the central ligament arises from the centre of the socket with a broad triangular root, and the fimbriæ surround the root of the ligament ; the hollow or dimple where they lie is covered with the delicate villous lining of the joint. The villous coat is here loose and soft, the hollow in the centre of the acetabulum feels soft and pulpy, and the fimbriæ hang out from it into the cavity of the joint. By this connexion of the fimbriæ with the root of the central ligament, they are moved in every motion of the joint ; and by lying in this hollow, these soft and delicate parts are protected and concealed, for the pelvis hangs upon the top of the thigh bone by the upper part of the socket, which is deep and firm,

while these parts lying at the bottom of the socket escape the pressure, and feel only, in the most gentle manner, the rotation of the thigh bone; but when the trochanter is struck with a violent blow down into the bottom of the socket, these softer and more sensible parts are hurt, violent pain ensues, and this bruise of the acetabulum, an accident which happens most frequently to old women, is followed by high inflammation of the joint, ending sometimes in caries and anchylosis.

But boys are subject to a disease different in many essential points, for in boys the disease of the acetabulum begins from a slighter blow, or without any blow, and proceeds unaccompanied with pain; it is seated not so much in the soft parts as in the bones, and proceeds from the imperfect union of the three bones composing the socket, their imperfect ossification, their soft and vascular state. This caries of the hip joint in boys is accompanied with little pain, there is much swelling from the vascular and susceptible condition of their bones, the thigh bone is absolutely protruded from its socket, and the limb is remarkably elongated during all the first stage of the disease*.

Thus when we consider, even superficially, the peculiar forms of this joint, and the internal constitution of its parts, we begin to understand its various affections; we perceive, why a bruise of the acetabulum should be very severe in the falls of people heavy, unwieldy, and advanced in years, and why in them the pain and lameness should continue long,

* I have entered fully into this subject in "Two Lectures on the Injuries of the Spine and of the Thigh."—C. B.

succeeded also by a stiffness or absolute ankylosis of the joint, but without any remarkable affection of the bones. We perceive, why in the soft and growing bones of boys the disease should have a deeper seat in the bones themselves, assuming more of the form of a constitutional or scrophulous disease; and if we consider the rambling amusements of boys, their falls in climbing and on the ice, the eagerness and thoughtlessness with which they pursue their amusements, forgetting the hurts they receive, and the Spartan fortitude with which they conceal them, we shall not wonder at this affection of the hip joint being the peculiar disease of boys, nor at its being very rarely observed till it is almost beyond help. From the insensibility of the bones, the joint is ruined before the boy begins to complain, just as a psoas abscess is perceived at the groin, far from the seat of disease (which is in the lumbar vertebræ) before the caries of the vertebræ is even suspected.

From the imperfection of the socket at its lower part, the thigh bone is apt to be luxated downwards; and again, from the great length of the limb acting as a lever, and from the whole weight of the body resting upon this joint alone, it is often luxated upwards, by being twisted out of its socket. From the obliquity and unfavourable direction, together with the actual smallness of the neck of the thigh bone, it is often broken across; and from the blow upon the trochanter striking down the head of the bone into the bottom of the socket, the soft parts are hurt, the whole lining of the socket inflames, and the joint falls into irrecoverable disease.

It is further to be observed, that this joint is covered by big and powerful muscles, so that when

the neck of the thigh bone is broken, it is so violently retracted, that the two ends are not regularly opposed to each other, and are never rightly reunited! when the thigh bone is luxated, it is so retained by those strong muscles, that its immediate reduction is not easy, and the distorted head of the thigh bone is so braced down against the large bones of the pelvis! whence it contracts strong adhesions, and its reduction after some interval of time is absolutely impossible: and lastly, when the acetabulum is injured, such is the weight of this massy limb, that the slightest movement of it gives excruciating pain, hence the patient lies for many months exhausted with fever and pain, bent into the posture which he can best endure till ankylosis is formed, and then he rises with a lame and wasted limb, the thigh bone immoveably united with the pelvis, and the thigh very frequently standing out at right angles from the body. But worse than all, this deepness of the hip joint, surrounded by such thick and massy muscles, prevents us distinguishing easily these various disorders! the dreadful pain which the slightest motion produces frightens the surgeon from those examinations in which his patient's safety entirely consists, and luxation, which is so easily reduced, often passes for fracture, so that the reduction is neglected or is mistaken for a bruise of the acetabulum or some incurable hurt, till the luxation itself becomes incurable. So much do surgeons despair of doing any essential service in disorders of the hip joint, that if they fail to distinguish the nature of the accident at once, they apprehended that twisting such a limb, and torturing the patient, is but an unmeaning cruelty.

Thus you find yourselves slightly initiated into

certain pathological doctrines which must be more fully explained.

GENERAL PATHOLOGY OF THE HIP JOINT.

The soft parts of the living body, when they lose their principle of life, die at once, are dissolved, and perish; but the bones, after death, retain their former properties so perfectly, that in reasoning on their diseases, we almost forget that they ever were alive. Physiologists have been slow in arriving at the right knowledge of the bones, and pathologists have been still slower in applying that knowledge to the state of disease; the inflammation and exostosis or swelling of bones, the caries, ulceration, or erosion, as it has been called, of bones, the various changes produced by disease, have never been explained by the living action of the vessels of the bone. The ignorant man regards the bones merely as bones! and bones, in his estimation, are just what he sees them on the anatomical table or in the cemetery! there they appeared as perfect as while they made part of a living body! if such a bone were broken, the breach could be repaired by any substance capable of concreting firmly round the broken ends of the bone! and he never conceives any more complicated idea of the reunion of a fractured bone in the living body than such a concretion, a pouring out of some ossific juice which concretes round the fractured part.

Is a joint stiffened by ankylosis, then it is the coagulation of the synovia that glues the bones so firmly together that they lose their motion! Is a luxation from length of time become irreducible, it is because in the intermediate space the exudation of

the synovia into the socket has filled it up! is there formed a new socket upon the back of the haunch bone, or has the head of the thigh bone changed its form—have exostoses and prominences of fantastic shapes been produced round these bones, that too is from the coagulation of the synovia, or the concretion of an ossific juice! is the bone carious, that never is regarded as an ulcer of a living bone; the bone is regarded merely as a dead and inanimate part invaded by some dissolving fluid, whence the ulcer is termed an erosion of the head of the bone or of the socket, it is said to be corroded by some chemical menstruum, just as it has been affirmed time immemorial, that blood dissolves bones. Petit, in a superb dissertation on the causes of ankylosis, attributes every thing to the synovia, to the defect or superabundance of it, to its acrid or its acetous vices, and the stiffness, the dryness, the simple ankylosis of the joint, the erosions and caries of the ligaments, cartilages and bones, and all the other consequences of acrid synovia, he very fully describes. This destructive liquor is not described by Justamond as by Petit, under the title of *synovie aigre*; it is not exactly vinegar, though it is something as bad, which dissolves the cartilages, and produces caries of the bones; “the glands tumefy, and sometimes produce a synovia, which, partaking of the distempered nature of the organs that supply it, is not entirely absorbed; or else this liquor degenerating becomes acrimonious, destroys the cartilage lining the surface of the joint, and the head of the bone; the articular and capsular ligaments are eroded with caries, and in process of time,” &c. But in truth, such acrid, acid, eroding secretions, have no more to do with

the destruction of the bones and cartilages, than the thin ichor of a chancre has with the sore from which it proceeds, which neither produces the sore, nor can produce a similar ulcer in the adjacent parts. The soldering together of bones, and especially the soldering together of the acetabulum and thigh bone, are expressions continually repeated by Justamond, Gouch, Pott, Bromfield, Warner, Petit, and all those authors who have written on the bones or on fractures; but if there be meaning in figurative language, such expressions imply either very imperfect notions, or doctrines totally opposite to truth.

When a bone or a joint is injured, the ligaments and surrounding soft parts mass and thicken by inflammation, cling to the bones and support them; when a bone is fractured, it unites with the opposite broken end of the same bone; when a bone is not opposed, or not steadily opposed to another fractured bone, the continuity of vessels cannot be renewed, but still the vessels are excited, they secrete bone, and form new bone or callus within the substance of the surrounding soft parts, so that the broken ends of the bones, thus thickened and expanded, form new surfaces wanting indeed the properties of joints, but yet allowing of a degree of motion without pain. When a bone is luxated, and remains so, there also there is much laceration of the ligaments and soft parts, much inflammation, a high excitement of vessels, a secretion of bone, and often something representing the original socket is formed upon the convex surface of a great bone, as of the scapula or haunch bone. The surrounding ligaments always thicken in proportion to the violence done to the joint; the cellular substance also is inflamed and

thickened, the ligaments, insensible as they appear, not only inflame, but granulate and adhere with the fractured or luxated bone, and unite and mass along with the surrounding soft parts. There is another very singular consequence of this inflammatory action among the injured parts, and it is this, the surrounding cellular substance, ligaments, &c. are inclined to adhere at that part of the bone where there is little motion, and where the bone or the soft parts formerly connected with it are lacerated, while the same cellular substance and lacerated ligaments continue disconnected with the head of the bone, which is lubricous and smooth. Thus, a bone, whether fractured or luxated, contracts new adhesions, new connexions, and forms for itself among the cellular substance, new capsules and ligaments of such thickness and strength too as not merely to bear the motions of the new joint, but such as to suffer the whole weight of the body to rest or hang upon them.

PATHOLOGY OF LUXATION.

It has been, perhaps, too little observed, that the causes of luxation and of fracture are different; fracture always, or almost always, arising from a fall, a blow, or a violent strain of the muscles; while luxation as certainly arises from a twist of the joint, and happens only when the weight of the body, in some awkward posture, comes to bear entirely upon the joint, the limb being so far out of its natural direction, as to be entirely beyond the power of its own muscles.

The two great joints of the shoulder and hip are peculiarly liable to luxation, first, Because they are

ball and socket joints, moving in all directions with a free and circular motion ; secondly, Because of the length of the limb to which they belong ! for the joint is at the trunk of the body, and in any unlucky posture and twist of the limb, the whole weight of the body rests upon the joint, and the limb serves as a long lever by which the head of the bone is twisted out of its place. But as for the elbow and wrist, knee and ancle, they have but one motion, they are merely hinge joints, they are secured by bones, or by ligaments equivalent in strength to bones, they are rather fractured than luxated.

It is when the body slides or falls that the shoulder or hip are luxated, for then the whole weight of the body falls on the joint and bursts it up. If a man be struck, for example, upon the top of the shoulder, or if being thrown from his horse he pitches upon the shoulder, such accident may break the acromion which projects and defends the joint, or may fracture the clavicle which is the hinge as it were upon which the arm rolls (the only point indeed by which it is connected with the trunk of the body), but cannot luxate the joint. The shoulder is usually luxated, when having slipped a foot we put out the arm to save us from the fall ; the arm is at its full stretch, is raised and extended as high as the joint will allow ; the joint can allow of no further extension without bursting, and the limb is beyond the command of its muscles : in this critical posture is the arm when the whole weight of the body falls upon it ; the length of the arm is as a lever for twisting the humerus out of its socket, the joint is burst up in an instant with a crash and laceration of its ligaments, which is very sensibly felt by the man himself, and the head of the

bone is thrust down into the axilla, or is pushed perhaps under the pectoral muscle.

In like manner is the hip joint luxated by a twist, and not by a blow ; a blow separates the head, or breaks the neck of the thigh bone, or bruises the acetabulum, but seldom if ever luxates a joint. For example, when a man slips his foot, the limb glides in under the body, the knee is straight, the outer angle slides along the ground ; the leg in this oblique posture bears the whole weight of the body, the chief stress is upon the hip joint, the thigh bone starts up from its place, overleaps the cartilaginous border of the socket, and lodges on the back of the haunch bone or in the sciatic notch : thus is the thigh bone luxated upwards.

But if a man, for example, in driving a loaded cart, observes it heeling in a bad road, and likely to overturn ; if he strides out with one leg, plants it close to the wheel, and tries with his haunch to support the carriage ; if in this posture, and with the leg extended, he is unable to support the carriage and it falls upon his haunch, then the extended leg is as a long lever upon which the weight operates ; it bursts up the joint, forcing the head of the bone from its socket down into the sciatic hole or into the groin. The effect is quite the same, when a man in loading, for example, a sack of corn upon a cart, lays it upon the cart, and expects another person in the cart to support it, who, on the contrary, allows it to fall back upon him just when he is retreating, has moved one leg, and has the load half supported with the other leg and hip. The effect is the same, when a man loaded with a burden on his back slips

his foot and falls, so that the inside of one knee strikes the ground and sustains the whole weight of the body, the other having slipped from under him; and still it is from a twist that the thigh bone is pushed downwards, when a horse rears, falls backwards upon his rider and luxates the haunch, or when a man buried into a mine or pit, or crushed under the weight of earth falling in upon him, has his hip luxated.

In what degree the ligaments of the joint will extend when they are gradually dilated by a collection of serum within, we need not at present dispute. Unquestionably they are capable of distension, of almost incredible distension; but that the head of the thigh bone should be all at once displaced by a twist, forced clear out of its socket over the back of the haunch bone, and lodged in an instant at the distance of four inches from its natural place, without laceration of its ligaments, with its ligaments merely dilated, is impossible. There is, indeed, no fact of which we are better assured than this, that when the head of the bone is twisted out of its socket, there is no dilatation of the capsule, there is no subluxation, as it is called! the head of the bone never stands upon the edge of the socket, for then it would immediately fall back into its place; but the capsular ligament is burst, the central ligament is torn up from its root, the muscles which lie in the thyroid hole, or on the back of the haunch bone, are displaced, to make way for the head of the thigh bone, which lies betwixt the naked haunch bone and those lacerated muscles, and there it remains, undergoing changes which are of the most interesting nature.

OF LUXATION OF THE FEMUR DOWNWARDS.

First, While the head of the bone lies thus among the lacerated parts, the slightest motion occasions excruciating pain; and as the slightest motion prevents adhesion, the head of the bone continues long reducible. When the bone is first driven out of its socket, the patient hears the crash of the lacerating ligaments, and when a recent luxation is reduced, the head of the bone being distorted in respect of its posture, and very firmly braced down by the contorted muscles, goes home into its place, with a violence proportioned to the tension of the muscles, with a loud snap; but when an old luxation is reduced, the reduction, which is opposed by the strong adhesions, requires a force equal to that by which the bone was luxated, if not greater; and in the instant in which the adhesions give way to that force, the patient and the surgeon both feel the same crash of laceration which accompanied the first displacement of the bone; it often sounds as if the neck of the bone were broken by the violence. This is the sign of the luxation being reduced, and the surgeon should be aware of it; for I have often been sensible of this crashing and laceration among the ligaments, which announces the yielding of the dislocated bone; but as the head of the bone does not, in such old luxations, go home with a sudden nor distinct snap, the extension has, to my certain knowledge, been often continued, even after the bone has been reduced, and that with a degree of violence almost sufficient to tear the limb from the body. Observe

this in your future practice, and you will find that I am not incorrect; and if what I have alleged be true, the *vis percussio*nis (far from being a subject for thoughtless jokes) is perhaps absolutely necessary to the reduction of old and confirmed luxations.

Second, Though the capsule so entirely surrounds the joint, that it can in no case escape sudden laceration when the head is driven from its socket, yet the muscles, which are small, which turn round the joint with small tendons, and are implanted about the roots of the trochanters, and are but slightly connected with the capsule, are very seldom torn. The head of the bone bursts sheer through the capsule, and tears it in a very irregular way; but it passes out betwixt the tendons of the muscles, without tearing them; therefore it happens, that as soon as the bone is reduced, as soon as the head of the thigh bone is drawn out from among the lacerated parts on the back of the haunch bone, and again lodged in its proper socket, all pain ceases, the patient exclaims that he is relieved; and as the muscles preserve their attachments to the bone, and are now restored to their offices, he moves the joint as easily, and walks upon it as firmly as before, and returns to his business or pleasures sometimes without one day's interruption; and though the capsule is completely lacerated, yet as it is connected on its external surface with the surrounding parts, and these also are injured, they swell, and the surrounding parts being close, the edges of the lacerated capsule are regularly opposed to each other, and the entireness of the capsule is soon and easily restored; even rest is not necessary to these adhesions; but

observe that it is of the principle of practice I speak. You, considering the violence which has been committed, will not fail to use the proper precaution against the rising of the inflammation.

Third, When the head of the bone remains unreduced, new and important changes take place on the head of the bone itself, and on the part against which it rests. When the thigh bone is luxated downwards, it displaces in some degree the obturator muscle, and rests in the hollow of the thyroid hole covered by the lacerated muscle, and pressing against the bone, and there it lies braced down by the distortion of the other muscles. The surgeon cannot turn it in examining the parts, except in a very slight degree, so firmly is it embraced by the muscles; and besides, the patient is careful to prevent even the slightest motion, for motion is productive of excruciating pain. He lies immoveable for some weeks! the hollow in which the head of the thigh bone lies is lacerated and raw; the parts surrounding the neck of the thigh bone are also lacerated, which parts mutually adhere so as to form a new and perfect capsule. The head of the bone resting in the thyroid hole, as in a socket, comes at last to move in it with a degree of ease; and the pelvis, resting thus fairly upon the head of the thigh bone, is steadily supported; and though the leg is much lengthened in this luxation, so as to make the patient halt towards the sound side, yet the limb thus luxated downwards bears up the body firmly.

This is one striking peculiarity of the luxation downwards into the thyroid hole. But still farther changes take place, very slowly indeed, for the

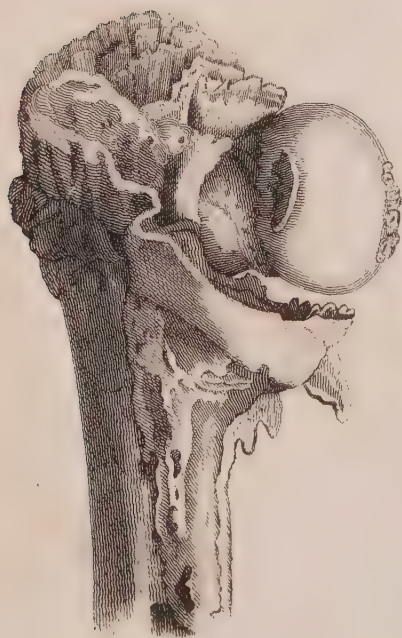
changes I mean now to speak of, affect the bones themselves. It seems to be after the thigh bone is fixed in its new situation, and after the continuity of vessels is restored, that the bones begin to change their form. The soft parts connected with this surface of the pelvis are all swelled, vascular, inflamed, and in the condition of the periosteum and soft parts surrounding a fractured bone. This mass of active vessels connected directly with the vessels of the bone itself, draws them also into an active state. A secretion of bony matter begins, the new bone is deposited in the now inflamed capsule in the surrounding cellular substance, and among the lamellæ of the obturator ligament, against which the head of the bone rests, and which is of course irritated and inflamed. The thyroid hole comes in time to be filled up with ossification, so as to make a bottom for the new socket. The edges of the thyroid hole sprout out so as to form lips or edges for the socket; and these edges sometimes are so deep as to surround entirely the neck of the thigh bone, and to form a complete box of bone*, in which the head of the

* Mr. Moreau, describing such a natural cure, remarking this profusion of new bone, and not understanding perfectly the process of ossification, considering always callus as something very different from natural bone, and never reflecting on this, that every piece of bone, when injured, when its vessels are opened, and the parts torn all around it! is apt to produce more bone, makes the following unphilosophical remark: "Nothing can be droller than the unequal distribution of the osseous matter which spreads to the contiguous parts, for there are bony vegetations at the upper part of the great trochanter which are of no use in the construction of this box (Boete Osseux)." In short, the gentlemen of the French Academy talk on such occasions as if Nature designed specifically and absolutely to make a box of a particular shape and size, and then having set Nature her task, and finding the box not exactly fashioned according to their imagination, and seeing irregularities

See p. 73.

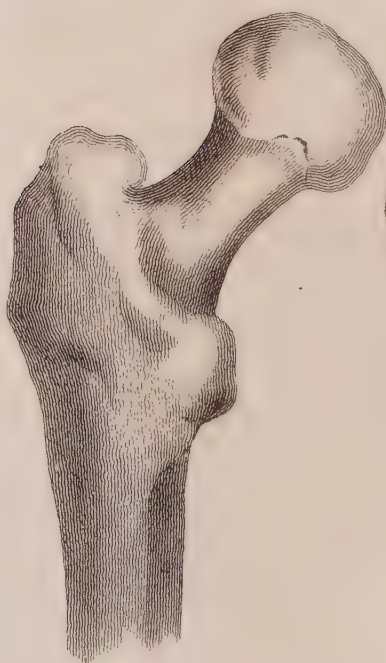


N^o 1.



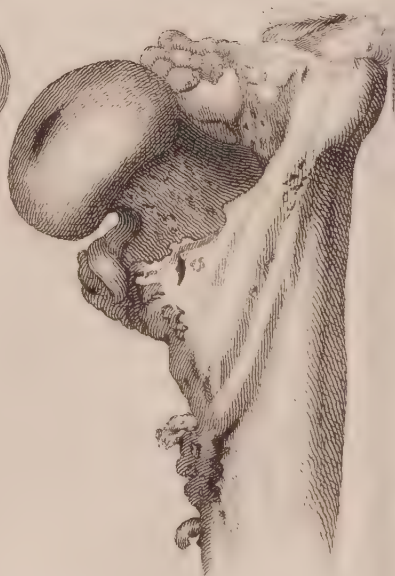
Ludwig.

N^o 2.



Natural Thigh bone.

N^o 3.



Sandifort.

thigh bone is so enclosed, that though perfectly moveable, the head cannot be disengaged from its new socket.

Nor does even the thigh bone itself always retain its original shape; while excitement enlarges a bone, pressure, on the contrary, prevents its growing in a young person, or even lessens it when full grown. The thigh bone, when thus luxated, bears the weight of the body in a new direction, the obliquity of the neck is lost, the head of the bone now receives the pressure in one direction only, whence the head of the bone is flattened, and the neck is in time depressed, loses all its obliquity, is shortened, and stands out at right angles from the shaft of the bone; and as the shoulders and neck of the bone now press against the lower part of the empty socket, that part yields to the pressure, the lower edge of the socket is depressed inwards, and the general cavity of the socket, now forsaken by the head of the bone, is almost filled up.

which they did not expect (and which they have no theory, except, indeed, the old Stalactytical theory), to account for, they think Nature's work "very absurd and droll."

I have given a drawing of one of the most extraordinary facts in this department of pathology. I have represented a thigh bone which was luxated downwards and backwards into the sciatic notch, and there formed for itself a new socket, where, though entirely enclosed in the box, as the French academicians have chosen to call it, it was still entirely moveable. "*Coxa est sinistra cum osse femoris, cujus caput intra profundissimum acetabulum sic retinetur, ut, licet certo sensu mobile et nullibi cum acetabulo concretum sit, tamen ex eo tolli nequeat.*" Even Sandifort, a pathologist much superior to Moreau and his confreres, is much at a loss to explain this phenomenon. In one place he says, "*Tota capsula articularis videtur hoc in parte in os abiisse.*" One thing is very curious, that in this new socket there is a certain opening separated from the rest by a thin partition of bone, through which the vessels enter which supply the joint.

LUXATION OF THE THIGH BONE UPWARDS.

Fourth, When the thigh bone is luxated upwards, and remains unreduced, the new joint, and all its apparatus, is less perfect, and the patient continues very lame. The head of the thigh bone is now lodged on the back of the haunch bone, upon a flat and gliding surface, the head of the thigh bone obtains a fixed place very difficultly; there is no hollow like the thyroid hole to receive it; the convex head of the thigh bone is applied to the flat surface of the haunch bone, so as to touch it almost by a mathematical point; there is not here, as in the luxation downwards, a variety of surface and great extent of bone wrought upon by the head of the femur; the generation of bone is very sparing; an accidental socket is indeed formed, but shallow, smooth, irregular, not deep, not sufficient to receive or lodge the head of the thigh bone; it is rather a dimple than a solid socket, and looks merely as if the haunch bone, being softened, had been slightly impressed by the head of the thigh bone. How does the patient walk, then, in this case? Very miserably. His thigh bone rather lies upon the side of the haunch bone than under it, so as to support the weight of the body; the weight of the body is suspended upon the head of the thigh bone by the strong ligaments that are generated out of the lacerated capsule, aided by that cellular substance which connects the lower surface of the glutæi muscles with the bone. The dislocated leg is remarkably shortened, and when the patient rises on the sound limb to make a new step,

the luxated bone hangs in air ; and when the dislocated limb is in its turn put to the ground, the whole weight of the body falls heavy upon those thickened ligaments ; at every step the patient twists the body, and turns the pelvis so as to throw the haunch bone flat upon the head of the thigh bone, and this inclination of the trunk, together with the shortness of the limb, distorts the whole body ; and in this case, the weight falls so heavy upon the neck of the thigh bone, that it gives way under it. The head of the thigh bone is flattened, the neck is shortened, it is also bent downwards, as if it had given way, as if it had slid a little lower along the shaft of the bone. When we look at the thigh bone which has been long luxated, we should at first believe that it had been actually fractured, and the neck shortened ; but upon examining the neck, we find no mark of fracture, while we easily distinguish many marks of the long continued pressure, for the whole of the upper part of the thigh bone, even to the trochanters, is extenuated ; the neck is somewhat extenuated and bent down ; the head, also, is smaller than that of the sound thigh bone ; and on the top of the globular head of the thigh bone is a depression or flatness, indicating the place where the back of the haunch bone rested upon it.

In such a luxation remaining unreduced, the weight of the trunk is ill supported, the motions of the joint very imperfect, the limb remarkably shortened, and wasted in some degree, while the whole person is distorted and bent towards the lame side. Though such luxation happened during infancy, the person never recovers, but continues lame, pained, unable to ride on horseback, easily fatigued, equally unfit for

business or pleasure, and reminded of his misfortune every moment of his life*.

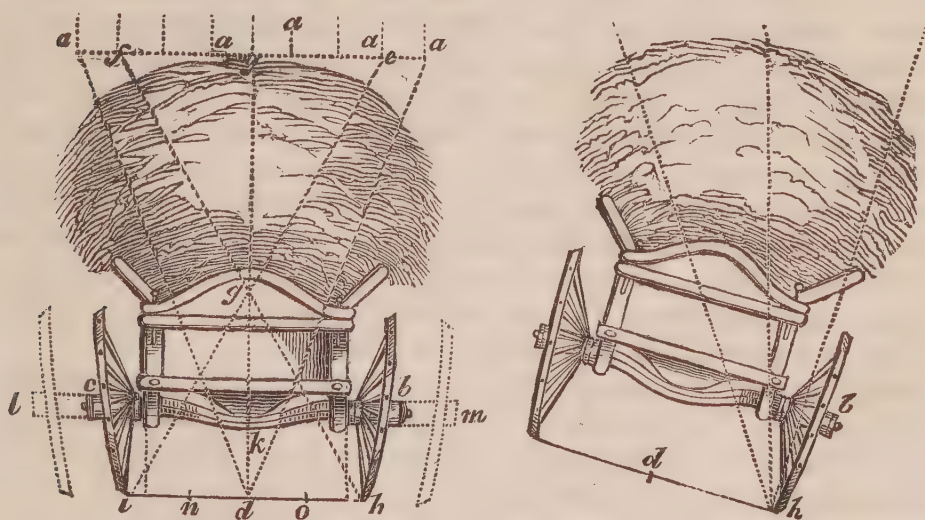
PATHOLOGY OF FRACTURE OF THE NECK OF THE
THIGH BONE.

Perhaps there is no provision of nature more beautiful and simple than the obliquity of the neck of the thigh bone, and it may be compared with a very curious piece of mechanism in the structure of a wheel, which the coarse hand which fashions the wheel does not understand. The dishing of a wheel is that hollow form which is produced by fitting the spokes into the nave at a certain angle, and this angle is so contrived, that when the carriage inclines to one side, the spoke, at a certain angle of inclination, is perpendicular to the load with which the carriage is loaded. Thus, while a carriage moves along upon even ground, the load is equally divided between the two wheels, the spokes lie out from the carriage at an angle, the load falls upon the spokes of each wheel in an unfavourable direction, but then both wheels bear an equal share of the load. On the contrary, when the carriage moves on uneven ground, and is inclined, it moves upon one wheel only, while the other just touches the ground; then one wheel alone supports the whole load, but it supports it in a direction per-

* One of the plates contains a drawing of a thigh bone long luxated, where (a) shows the new socket very superficial. (b) The old socket almost obliterated by the pressure of the head of the thigh bone on its upper border. (c) The neck of the thigh bone depressed almost to right angles with the shaft. And (d) the head of the thigh bone flattened above by the pressure of the haunch bone against it.

fectly favourable, for the spokes of that wheel which bears the load are exactly perpendicular to the direction in which the load gravitates*.

The pelvis, like a carriage with dished wheels, rests so upon the thigh bones, that while the body stands direct and firm upon both legs, the two thigh bones bear each their equal share of the weight, the necks of the two thigh bones have all their obliquity, they support the body in an unfavourable direction; but the moment that the balance of the body is changed, when the body is so inclined as to rest more upon one leg, that leg is fixed by the weight of the body, the other leg is left free to make a step, and while it moves, the fixed leg sustains alone the whole weight! but at such time the pelvis is so inclined towards that side, that the neck of the thigh bone comes into a new direction, and the weight bears upon it almost perpendicularly. From this analogy it is very plain, first, that when the body is supported equally on both thigh bones, as in fig. 1, they bear the weight in an



EXPLANATION OF THE DIAGRAMS.

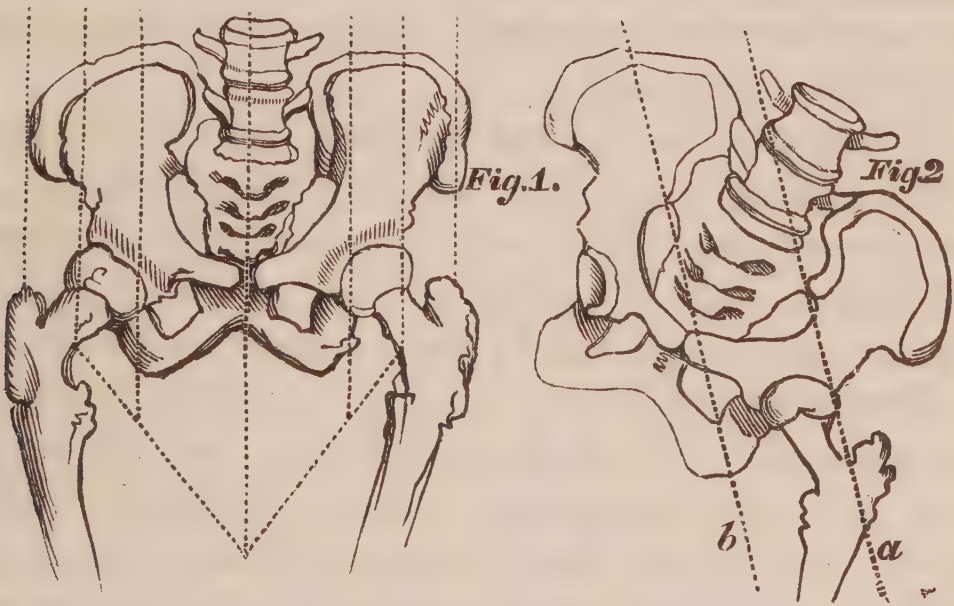
* In these two plans (a a a) signifies the perpendicular direction in which all bodies gravitate, and the angle (d e f) represents the whole load, while (d g) represents the centre of gravity of the

unfavourable direction ; but then each bears its own share, and the centre of gravitation falls exactly in the middle betwixt the two thigh bones, as it falls exactly in the middle betwixt the two wheels of a cart moving on level ground. But, secondly, that when the body is designedly inclined to one side, the whole weight falls upon the neck of one thigh bone, but then it falls upon it in the most favourable direction ; the gravitation is not perpendicular, it is transverse with regard to the direction of the neck,

whole. Were a wheel put in at (k), the whole load would be balanced upon that single wheel, but by two wheels the basis which bears the load is broadened, the carriage stands firmer, and broadening the basis still more by prolonging the axle, and removing the wheels to (l m) still further from the centre, the carriage would be still more steady. The whole load then is divided equally betwixt the wheels (b and c), and the angle (i g d) shows what proportion of the weight belongs to the wheel (c), while (i g) shows the oblique direction in which the spokes of the wheel (c) bears its load, the angle (h g d) shows the share of the weight which the wheel (b) bears, while (h g) shows the direction in which the wheel (b) bears its load. The result of this demonstration is, that the load is borne by the wheels (b and c) equally, because the centre of the whole load (d) is also in the centre of the carriage, and in the middle betwixt the two wheels. But whenever the carriage comes to be inclined, the point (d) begins to travel along the line (h i), and whichever wheel it approaches, that wheel bears a part of the whole weight, greater in proportion as the centre of gravity approaches it. When the centre of gravity removes to (n), the wheel (c) bears more ; when, on the other hand, it is transferred to (o), the wheel (b) bears more than its due proportion, perhaps three-fourths of the whole weight. When the carriage is so inclined that the point of gravitation arrives at (h), the wheel (b) bears the whole weight, and when it passes (h) the carriage overturns.

In the second diagram, this degree of inclination is demonstrated ; the point (d) has travelled from (d to h), the carriage is at the greatest point of inclination, the wheel (b) bears the whole weight, not obliquely, as in the first figure, where the proportion of weight borne by the wheel (b) is marked by the angle (h g d), but in figure second, the line of gravitation, which is marked (d g) figure first, coincides with the line (h g) of figure first, which is the direction of the spokes of the wheel (b) ; for the line (g d), which is the line of gravitation, moves by the inclination of the carriage towards the line (g h).

it is in the direction of the neck itself, which is oblique, as at (a figure 2.); and thus the weight, instead of falling upon the neck, which is the weakest part of the thigh bone, is transferred to the middle of the thigh bone at (b), which is its strongest part. Thirdly, it appears that if, while the body is standing or moving perpendicularly upon both thigh bones, one leg slip from under the body, then the whole weight of the body (with the additional weight, perhaps, of a burden, or with the shock of a fall from some considerable height), falls suddenly upon the neck of one thigh bone, in an oblique and unfavourable direction, in consequence of which it is liable to snap across.



Thus our body is everywhere perfect and imperfect; wherever there are particular provisions of nature, we are sure there is some weakness or defect. This obliquity of the neck of the thigh bone is at once the cause of its weakness and of its strength. First, It is necessary that the joint should move in large and free circles; and for this purpose, the head is set off

from the shaft of the bone by a considerable length of neck. The position of this neck, which is almost transverse, in many circumstances, to the gravitation of the body, is the cause of its frequent fracture. When a man, dropping himself from a window, expects to light equably upon both legs, and the whole force falls upon one; when a man, going down a staircase which has no rail, walks over the side of the staircase in the same posture as if he were making a fair step; when a man walking along on even ground falls into a pit, for example, into the unguarded foundation of a house, he is liable to break the neck of the thigh bone, which is also, sometimes, broken by a blow upon the trochanter, and sometimes by slipping the foot, and falling sidelong, though such an accident more commonly bursts up the ligaments and luxates the joint.

For ages physicians had imagined that the hip joint was exposed to no other accident except luxation, nor was any doubt of this ever suggested till the time of Paræus. He was called to a lady, whose hip joint he thought was luxated; he imagined, also, that he had reduced the bone by extension, and accordingly he secured it with a slight bandage; but the next day, when this bandage was undone, he found, to his great surprise, the limb shortened again, and then only did he become sensible that the thigh bone was broken at its neck.

This single observation was not unimportant, nor was it overlooked by his contemporaries. The same passion for novelty which makes every new quackery acceptable in the present day, made every new observation, especially concerning dangerous luxations and fractures, acceptable to the diligent honest people

who professed, in those days, neither philosophy nor the talent of making discoveries, who affected nothing but plain surgery. There were not many anatomists ; their observations were few, but they were respected ; they were, indeed, received with such universal enthusiasm, that often, as in the present instance, their new observations degenerated into new prejudices. It had been the opinion, for many ages, that the hip joint could only be luxated ; but in the beginning of the present century it became the universal opinion, that no degree of force could luxate the hip joint without fracturing the neck of the thigh bone ; if they acknowledged luxation, it was only that species of it which they termed luxation from an internal cause, or, in other words, the suppuration of the joint ! the hip disease.

Ruisch, the great anatomist of the last age, was the first to remark how thin the bony lamella is which forms the neck of the thigh bone, and how wide and large the cancelli are in that part. He boldly concluded, from this weakness of the neck of the thigh bone, that fracture of that part was infinitely more frequent than luxation of the joint.

This subject fell next into the hands of the speculative physicians, who sat in their closets writing about surgery ; they also noticed this singular thinness of the bony walls, and especially this wideness and openness of the cancelli in the neck of the thigh bone, and assigned the true cause for this peculiar structure. “ The neck of the thigh bone has an osseous lamella externally no thicker than the nail, and within it is nothing but mere cellular substance. How, without this peculiarity of structure, could the marrow rise along the tube of the bone, or exude as

it should do into the cavity of the joint? How could this exudation take place without this open texture of the cancelli? This is the reason why slender people feel always a sort of pain and weariness after walking far."

When once their imagination had gone abroad in search of theories to explain what they had resolved to believe, they proceeded next to examine the ligaments, and having proved the bones weak enough to account for the frequency of fracture, they made little doubt of being able to prove, by the strength of the ligaments, that they were too powerful to admit of luxation. "This ligament," says Boerhaave, "this central ligament of the thigh bone, is of such remarkable strength, that though you should take a corpse, hang it by the heels, and hang a weight of a thousand pounds round the neck, it will never give way." The observation of Fernelius is still more decisive:—"When Count Sebastian was executed at Leyden, four wild horses could hardly tear the limbs asunder."

Yet let us do no injustice to the memory of Ruisch. He was persuaded that fracture of the cervix femoris was the more frequent accident, not merely by this observation of the thinness of its bony lamella; he seems to have inquired into the fact with commendable diligence. "I am informed," says Ruisch, "by D. Borst, who, in the course of his surgical practice, has many opportunities of opening the dead bodies of cripple old women, that of eight bodies which he had dissected, he had found not one of them luxated, but in every individual of them there was a fracture of the neck of the thigh bone."

To this opinion of fracture being infinitely more

frequent than luxation, Boerhaave, as I have already intimated, set his seal in the most deliberate and formal manner, after reviewing all that the others had done. This closed the dispute; and, I must say, most unhappily for the public. Let it once be supposed that the thigh bone can only be fractured, and all other accidents of the joint will be utterly neglected. That all the other accidents, and especially luxations, have been so neglected, especially in Holland! that many, whose thigh bones should have been reduced, had remained lame and miserable for life, is most unhappily proved by the splendid museums of Ruisch, Hovius, Vandoveren, Albinus, and Sandifort. But these are melancholy proofs, and indeed we have little reason to dwell upon them, for the reproach is universal, and our surgeon Chesselden also gives drawings of unreduced luxations. This opinion, that luxation could not happen, was received here in England chiefly on the authority of Boerhaave, and prevailed so much, that even to the present day, in the various collections of cases, we find numerous examples of the luxation of the thigh, and wonder why such insignificant cases, so uniform, and all so like each other, should be at all received into collections; they are related merely to prove that luxation of the thigh is not impossible, as Boerhaave affirmed.

But I make my appeal neither to Paræus, nor Ruisch, nor Boerhaave, but to the structure of the joint itself; to that I return as the surest guide, while the opinions of authors serve but as accidental illustrations. It is from the insecure state of the epiphysis in children, from the singular thinness of the neck of the thigh bone in old age, from its transverse position, together with the hazardous leaps and

falls of men in the prime of life, that this part is exposed to fracture. To speak impartially, fracture is perhaps more common than luxation, though both are frequent.

WHY IS THIS FRACTURE INCURABLE ?

The difficulty of reuniting the fractured neck of the thigh bone has been too long acknowledged to be questioned at this time*, and the peculiar condition of this part of the bone, accounts too well for all our disappointments. The celebrated Dessault was full of expectation of accomplishing the cure of this fracture: "Why," says this excellent surgeon, "since the bony matter forming the neck of the thigh bone has nothing peculiar in its nature, why should not this fracture heal like that of the other parts of the same bone †?" The reasons are many, and not uninteresting.

When a bone is broken, the soft parts are thickened around it; there is a general soft swelling of the limb, accompanied with a particular tumor surrounding the fractured part, which tumor is hard and firm, and feels as if there were formed round the bone, a gland-like mass for the purpose of generating callus. When we break the leg of an animal, and examine this thicken-

* Celsus also gives his testimony to the difficulty or impossibility of effecting a cure. *Neque tamen ignorare oportet, si femur fractum est fieri brevius; quia nunquam in antiquum statum revertitur summisque digitis postea cruris ejus insisti, sed multa tamen femoris debilitas est; si vi fortunæ negligentia accessit.* Lib. viii. cap. x.

† Si la matiere osseuse qui forme le col du femur n'est pas d'une nature particuliere, pourquoi sa fracture ne gueriroit-elle pas comme celle des autres parties du même os, lorsqu'elle est reduite et contenue par des moyens efficaces? et pourquoi seroit-elle suivie d'accidens extraordinaires? Page 353.

ing, we find the muscles, the cellular substance, and the periosteum thickened, and firmly adhering to the ends of the broken bone, the part is very vascular, and it would appear that this turgescence, swelling, and high action of the vessels, were determined to the generation of bone, which being generated, the action subsides, and the swelling and thickness dissolve.

When we take a bone broken twenty years, for example, before the person's death, and inject its vessels, we find that the same connexion of the vessels still subsists, that from the vessels of the periosteum the injection penetrates the callus more freely than any part of the bone.

When a bone dies, the first accident that ensues is separation of the periosteum from the dead bone, inflammation of the surrounding parts, a swelling, hard, firm, and limited expressly to the necrosing part of the bone; the hardness exactly resembles that of a recent callus; and the issue of this process is, that the active state of this mass forms a new bone, in the centre of which the dead bone remains enclosed.

We find it essential to the reunion of a fractured bone, not only that the ends of the bone should be alive, and should have each the inherent power of producing new bone, but that the two broken parts of the bone should be united in their office, that they should actually adhere, that their vessels should mix, that they should support each other; and on this account, wherever bones are healing prosperously, you can distinguish outwardly that swelling of the parts by which they are held together in this posture of adhesion.

When the tibia and fibula, the radius and ulna, or

any other well supported bone, is broken across, the surrounding parts, muscular as well as cellular, are lacerated ; and by the inflammation of the cellular and muscular substance, in concert with the periosteum, that mass is formed, which by the activity of its vessels, works the blood towards the immediate fracture ; and though we cannot say, that any organization but that of the bone itself is directly capable of regenerating bone, yet we plainly perceive the necessity of this thickening of the surrounding parts, which is like a temporary gland instituted for the purpose of secreting bone.

Now, when the thigh bone or tibia is broken (supported as they are by surrounding parts), there is a great inflammation and thickening of the surrounding flesh, by which is formed a large and firm callus. But when the rotula or knee pan is broken, we have to do with a bone which is in very different circumstances. The muscles of the thigh are indeed implanted into the rotula, but they are implanted at its edge ; except at its upper edge, no fleshy part touches the bone, it has no medullary canal, no remarkable vessels ! this bone is connected with the tibia below by a strong and hard ligament, its sides receive the tendons of the vasti muscles, its inner surface is lined with the delicate capsule of the knee joint, the bone, indeed, lies properly within the joint, and is covered on its external surface only by the broad fascia of the thigh. This bone is insulated, floating upon the surface (as we may express it) of the knee joint, connected only with ligamentous and tendinous parts, and is excluded by the expansion of the fascia from any connexion with that softer cellular substance which lies under the skin ; it is of all the bones in the body the least

supported by surrounding parts, the least apt to reunite. Of forty broken patellas, examined by Callisen and Camper in the various museums of France, Germany, England, and Denmark, not one was perfectly reunited. The patella, when broken, is joined only by a ligamentous substance, long or short, according to the circumstances of the fracture, or the dexterity of the surgeon.

When the patella is fractured, a singular puffy emphysematous-like swelling rises instantly over the knee ; it feels absolutely as if the parts were inflated with air. The swelling is very great, but very soft. In no stage of the cure can we observe any knotting or massing of the parts round the fractured bone ; never was there an exuberant callus known to shoot out around a broken patella. The only two patellas which are actually united are in the possession of the ingenious Dr. Sheldon ; yet even in these there is a distinct line of imperfect ossification traversing the patella, and marking the fracture.

From these facts, what should we conclude ? Surely this, that a complete reunion of the patella is almost impossible ; the defect exists in the part ; the surgeon cannot be blamed, though we may, if we choose, accuse Nature of a manifest imperfection.

When the neck of the thigh bone is fractured, the capsule sometimes remains entire ; the capsule is of an insensible nature, entering very slowly into action ; and within that ligamentous and insensible capsule is included the whole length of the neck of the thigh bone. The neck is surrounded with mucous fringes, and the cavity in which it lies is lubricated ; the periosteum and ligaments are slow in entering into action or inflaming, even where they are lacerated,

but when they remain entire, they exclude all connexion of the fractured bone with the muscular parts. Thus, unassisted by any of the usual adhesions, the neck of the thigh bone is left to its own intrinsic powers; naked bone is opposed to naked bone, and not very regularly opposed, for the ends of the fractured cervix are so obliquely placed with regard to each other, that more than the usual callus would be required for their reunion! and yet they are so entirely deprived of any support from surrounding parts, that less callus is produced, often none! they frequently remain disunited*.

The neck of the thigh bone, which is completely insulated in its natural condition, can form, when broken, none of those connexions with the surrounding parts which should help to make up a mass capable of retaining the bones in close contact, and of assisting in the generation of callus. This is the reason why all our ingenuity is exhausted in vain, why each successive generation has condemned the inventions of the preceding age. All our hopes of succeeding in the cure of fracture in the neck of the thigh bone have been successively abandoned, and we are almost persuaded to subscribe to the bold unlimited affirmation of Platner, "*Nunquam os ea parte glutinari posse, nec membrum in antiquum*

* Every where this fact is acknowledged, often in such expressions as these, "*Le cal de femur ne paroît pas propre à fournir la matière du cal.*"—*Memoires de Chirurgie.* But I find nothing like an explanation of this fact, unless, perhaps, something like one were to be picked out of a transient expression of Parée, who says "*La fracture faite près des jointures est plus malaisément guerrie, pource qu'à cause des nerfs, tendons et ligamens, communs elle apporte de plus grands accidens, et que ce lieu est exangue.*"—*PARÉE*, p. 343.

That the part is bloodless, that the surrounding parts are little able to contribute their share in the cure, is the very truth.

statum reverti." The mechanism I have explained is, I fear, a true answer to the question of the celebrated Dessault, "Why should not the neck heal like any other part of this bone?"

But why is the neck of the thigh bone, when it does reunite, surrounded with so clumsy a mass of callus? This also must be explained; for it is a fact, and an interesting one, and must have a place in the account which I am presently to give of the various conditions in which the fractured thigh bone is found after death.

There are just two conditions in which the thigh bone will be found after a fracture of its neck. Along with the fracture of that part of the limb, there may either be much shortening of the limb, or very little; there may be a wide laceration of the capsule and surrounding parts, or none at all; and these two varieties of the fracture draw after them very important consequences.

Suppose a man to miss a landing place, and for want of light, go over a staircase perpendicularly in the attitude of walking forward; suppose him to fall into an unrailed area, or to drop desperately from a window, upon the cry of fire; he breaks the neck of the thigh bone, is sensible of what has happened to him, and waits the people coming with light. Here the patient lies without struggling, is carefully lifted by his friends, and is put into the surgeon's hands, with very little shortening of the limb. In such circumstances, the thigh is so little shortened, that the surgeon is at a loss at first to ascertain the nature of the accident; and if such patient die of fever, or if the other injuries prove fatal, the capsule is found

entire, inflamed, full of serous effusion, and red with the high action of its vessels, though not lacerated.

But if the man, being stunned by his fall, be insensible of all the injuries he may have sustained; if, when his friends first raise him, he strive to stand upon the fractured limb; if a man, being pursued, take a desperate leap, and after fracturing the neck of the thigh bone, still struggle to get on, and actually walk upon the fractured limb; if a drunken man fracture his thigh bone, and be raised up by his reeling companions, or by the people accidentally passing, and unconscious of the man's situation; if he stagger forwards upon the broken limb, the surgeon is sure to find it remarkably shortened, it is at least four inches shorter than the sound limb, the trochanter and broken neck of the bone are pushed upwards, the capsule completely torn, the cellular substance disordered, the muscles lacerated and displaced, while the broken part of the bone is buried deep in the midst of this laceration.

The import of those distinctions is greater than you may at first imagine. There are two conditions of the fractured bone; the one resembling the unsupported condition of the patella, the other resembling the condition of the tibia, or radius and ulna, where there is a great mass of surrounding muscles connected by cellular substance with the bone.

First, When the capsule remains entire, the limb is little shortened, the ends of the bone are indeed but little displaced, but then they are little capable of reunion. The whole joint is inflamed, the lubricating liquor is poured out in great quantities, so that the cavity of the joint is preserved, and even

enlarged ; the broken parts remain insulated ; the capsule, hard and insensible in its nature, enters slowly into disease ; the effusion enlarges the cavity of the capsule, all its thickening is outwardly (in respect to the cavity of the joint), so that even the hard and insensible capsule never approaches the fractured parts of the bone. The two ends of the broken bones pass each other, and are not supported nor connected together by the adhesion of the surrounding parts. They are not regularly opposed to each other, and though they were, they would be like the opposite pieces of the broken patella, very unfit to unite with one another ; they would be opposed naked to each other, bone to bone, and if they did unite, their union would be like that of the patella, ligamentous and imperfect.

It was only after considering the circumstances a good deal, that I could persuade myself of this part being ever in any instance fractured without a laceration of the capsule ; but I find many evidences of this important fact. There is especially one very accurate dissection of Mr. Dessault's, which I will recite to you. It was the dissection of the hip joint of an old woman, who having fractured the thigh bone by a fall, died the forty-fifth day after. Her thigh had been little shortened, no more than an inch and a half ; the cellular substance belonging to the muscles surrounding the joint was thickened ; the capsule of the joint was firmer and thicker than it naturally is, and enclosed a quantity of bloody serum ; the round ligament was torn away from the ball of the thigh bone ; the bone was in part also uncovered of its cartilaginous shell, and had begun to granulate ; the round ligament, almost entirely separated from the

head of the thigh bone, had spread itself in the bottom of the socket ; and the fractured neck of the thigh bone was united by a fibrous substance*.

This bone then was reunited, not with callus, but with something flexible like a ligament, resembling the substance by which the pieces of a fractured patella are joined ! with what Dessault terms a *fibrous production*. Whether the bone might have entirely reunited in the end, is still a question ; and this only is left certain, that very frequently the process fails, that the ends of the bone continue unconnected and loose, and rubbing upon each other with every slight motion of the joint, cartilages soon cover each end of such a fractured bone, and an unnatural joint is formed, feeble, and almost useless.

Secondly, It should be observed, that in every oblique fracture, where the bones overshoot each

* “ Le tissu cellulaire qui unissoit ces muscles près de l’articulation étoit plus dense qu’il ne l’est ordinairement. Le ligament capsulaire, qui avoit aussi plus de densité et plus d’épaisseur que dans l’état naturel, renfermoit un peu de fluide sanguinolent. On observoit à la partie inférieure et interne du ligament rond, près de son insertion, une petite portion de la tête du fémur dénuée de son cartilage et couverte de bourgeons rougeâtres. Le ligament rond lui-même presque entièrement détaché de la tête de l’os, s’épanouissoit le fond. Le col du fémur étoit réuni par une production, qui avoit l’apparence fibreuse : cet os avoit d’ailleurs sa longueur et sa direction ordinaires.”—DESSAULT, p. 344.

There are some things in this dissection especially worthy of remark. First, The thickening of the capsule, and the strengthening of it by the surrounding cellular substance. Second, The proof of the round ligament serving really and truly the purpose of a ligament, and resisting the force of the blow, retaining the head in the socket. Third, The ligament, when it is torn partly away, sinking down into the socket, expanding there, as Dessault expresses it, and accounting for the thickening of the parts within the socket, and causing that singular lengthening of the thigh bone which I have mentioned as an accident of luxation. And, fourth, The imperfect reunion of the neck of the thigh bone, and the sparing callus with which the parts are joined.

other and tear the muscles, the adjacent parts are engaged in the disease, the mass of parts affected by the injury is great, and the quantity of callus or new bone is proportioned always to the obliquity of the fracture ; so it is in this fracture of the neck of the thigh bone. When the patient, unconscious of the terrible accident which has befallen him, strives to rise, attempts to walk, rests the body upon the broken bone, and even falls forwards upon it, the upper part of the fractured bone is driven through the lacerated capsule, the muscles are displaced from their beds upon the back of the haunch bone, and the limb being shortened four inches, that difference of four inches in the length of the limb lodges the broken bone fairly among the lacerated muscles, or rather among the cellular substance which belongs to those muscles. Then the slightest motion of the limb gives exquisite pain, the patient is fearful of the slightest change of posture, both the surgeon is fearful of moving the limb, and the patient is unwilling to have it moved ; there the broken bone lies forming new connexions and strong adhesions, and a great mass of parts is drawn into consent. Now, it is this which helps to make up so large a knot of callus. Look to the drawings of whichever museum you please, of Chesselden, Sandifort or Ruisch, you will observe, that where the limb has been preserved nearly of its natural length, the callus is very sparing, and often the union of the neck of the bone has failed, the neck of the thigh bone has been entirely destroyed, and an unnatural joint formed ; while, on the contrary, a clumsy callus, or, as the older writers express it, a profusion of ossific matter, is always connected with a shortening of the limb.

We may thus deduce the difficulties of this kind of fracture from causes very different, from the imperfection of our machines. We perceive that the fracture of the neck of the thigh bone must be desperate in order to be cured. We are sensible that if the limb be but little shortened, and the broken bone surrounded only by its capsule, and very slightly lacerated, or not at all, the parts surrounding the broken bone being incapable of adhesion, unfit for the necessary process of generating bone, the callus will be imperfect, the bones will continue to move upon each other, an unnatural joint will be formed, and there will be only a thickened capsule and condensed cellular substance for the whole weight of the body to hang upon.

But if the limb be much shortened, and the fractured bone driven deep among the lacerated flesh ! out of the surrounding parts will be formed a great vascular mass. The bone will be thoroughly reunited, but with a very clumsy callus, which will cause lameness, as remarkable to others, though less wearisome or painful to the patient himself, as that where the unnatural joint is formed ; for the limb is, in the case of a large callus, shorter and more awkward and more limited in its motions, but it is withal firmer, better supported, more hardy and useful. In short, the whole subject draws itself naturally into this plain conclusion ; in fracture of the neck of the thigh bone there will be either too big a callus, or none at all, and the perfect cure of this accident is almost impossible. If there be any truth in those conclusions, the facts of pathology should confirm them ; nor can any subject of inquiry be more interesting than the derangements of parts which have made thousands

lame and miserable. Allow me, then, to explain to you as briefly as possible, the various conditions in which the fractured thigh bone is found upon dissection.

First, Where the capsule remains entire around the bones, this effect will generally follow : The action of the living powers in the two parts of the bone being unsupported by any continuity of vessels, will soon subside ; the ends of the bone, in place of spreading out into broad surfaces, will shrink and become attenuated ; it is said, in such case, that the neck and shaft of the bone are absorbed ! So they are, but they are continually absorbed ! During every moment of our existence each part of the bony system is in a state of continual absorption, and new parts are as continually depositing ; it is only when the absorbed parts are not replaced, or, in other words, when the vessels of a bone fail to nourish it, that it shrinks and is wasted*. The upper part of the shaft of the bone then, having lost its continuity, no longer retains its size, the neck entirely disappears, the two ends of the bone become small, are rounded off, are tipped with cartilage ; the capsule strengthens in proportion to the pressure it suffers ; the head of the thigh bone remains in the socket, its neck is in part or entirely absorbed ; the upper part of the bone, where the neck was broken, is covered over with cartilage, the joint which is formed is imperfect, lame, and unserviceable. From

* This the older surgeons ascribed to friction : *Hanc vetulam non solum claudicasse ad vitæ terminum, verum etiam in cadaveris apertione inventum fuisse dicti ossis collum in totum deficere, et in nihilum adeo fuisse redactum ut nihilum quidem remanserit Gerardus Borst, chirurgus Amsteladomensis satis expertus, qui cadaver præsentibus variis medicis et chirurgis liberalitate sua museum meum illo objecto adornavit.*—RUISCH, p. 30.

such a limb the body has no other support than by the haunch bone hanging very uneasily by the thickened capsule upon the top of the thigh bone.

This is very frequently the condition of old women, whose thigh bone being thin in the neck, is easily broken. The awkwardness of their clothes trips them, their fall is awkward, so as to break the cervix femoris, without pushing it deep among the muscles. This condition of the parts is known after the recovery of the patient, by the shortening of the limb, by a clucking noise when the bones move upon each other, like the crackling of the joints when twisted (as in champooing the fingers), by the entire lameness, and by the frequent accessions of pain; for every joint so injured becomes rheumatic.

Second, When in consequence of great violence the capsule is completely torn, the limb remarkably shortened, and the broken end of the thigh bone pushed upwards among the muscles, there is often a great massing of parts, and a large callus; but if the broken trochanters of the bone are pushed far beyond the neck of the bone where it projects from the socket, if the broken part of the neck be opposed to the shaft low down where it is uninjured, no ossification will take place, no connexion betwixt the neck and the shaft of the bone will be formed. The upper part of the broken thigh bone then rests against the back of the haunch bone; it lies where the head of the thigh bone does in luxation, and obtains just such a union as the luxated bone does. The haunch bone is fretted and inflamed, and begins to form a flat socket-like surface; the upper end of the thigh bone also flattens, and sometimes enlarges, while the surrounding cellular substance condenses into the form

of a capsule. Such a limb hangs very high in air, it is much wasted for want of use, and entirely lame.

Third, When the upper broken part of the thigh bone (that broad surface I mean which is betwixt the two trochanters) is directly opposed to the broken neck, has a strong disposition to form callus, and yet is hindered by motion from uniting, and the friction keeps the vascular system of both bones in an active state; first, the head and neck of the thigh bone adhere with the socket, in which they remain, and form one mass with it; that mass gets a broad, flat, unequal surface; and that surface is opposed to a similar one on the face of the thigh bone, betwixt the trochanters. Both surfaces (both that of the conjoined cervix and acetabulum, and that of the top of the thigh bone), are covered with cartilage; the inequalities of one bone correspond with those of the other, and by the help of the original capsule much thickened, together with condensed cellular substance, a strong ligament is formed, and a flat and shuffling joint is completed, without the upper part of the bone being much displaced, or the limb much shortened, as it always is where the femur is lodged upon the back of the ilium.

Fourth, Even when the thigh bone is in the most favourable situation for a cure, when the capsule has been torn, when the capsule has entered with the other lacerated parts into inflammation, and has adhered to the bone, so as to support its broken ends in contact with each other, the two ends are not regularly opposed, the neck of the bone remains in the socket, the broken part of the bone, which should be opposed by it, is retracted by the force of the

muscles ; the neck adheres, indeed, to the shaft of the bone, but it adheres with it at right angles ; and the shortening of the limb, which is produced at first by the contraction of the muscles, is perpetuated by the manner in which the broken pieces unite ; in short, the neck of the thigh bone sliding down, as it were, lower upon the shaft, unites with it at right angles, and, by losing all its obliquity, loses four inches of its length.

Fifth, But it is not alone by the abridgment of its length that the limb is curbed in its motions ; the motions of the thigh are checked by two very singular causes. The length and obliquity of the neck of the thigh bone are chiefly designed for holding off the trochanters from the haunch bone, and are essential to the free motion of the joint ; and consequently when the obliquity and length of the neck of the thigh bone are lost, when the neck, being almost destroyed, the head of the bone is united close to the shaft at right angles, when the trochanter towers above the head of the bone, and is in actual contact with the haunch bone ; when the trochanter is still farther surmounted with a large irregular callus, and when the shaft of the bone lies flatter and closer upon the haunch bone, and rolls with smaller circles, the motions of the joint become short and imperfect ; the motion is, indeed, so checked, that the joint feels as stiff as if ankylosed ; and you are sensible, upon moving the joint, of the irregular callus chucking against the haunch bone. I have seen a young man in whom this chucking of the bones was very audible, and the joint, though not ankylosed, was so curbed in its motions, that when he made a step, in place of

moving the limb, he advanced that side of the pelvis, and turned the trunk ; the leg meanwhile being little shortened, not at all wasted, but firm and strong.

Sixth, The thigh bone, which is so often not united at all, or merely joined to the haunch bone by an unnatural and very imperfect joint, is frequently united with the pelvis immoveably by ankylosis. Both bones (the trochanter and the haunch bone) being hurt, both being in a disposition to generate new bone, connected at the same time by the adhesion of the surrounding parts, and kept steady to avoid pain, unite with each other by a broad surface, by a perfect continuity of vessels, they become as one bone ; the joint, and even the socket, are entirely annihilated ; the limb is in general remarkably shortened, hanging in the air, and wasted by want of use.

This may serve to explain some of the appearances of disordered joints, and may serve as an outline or hasty sketch of the pathology of the fractured thigh bone *.

* The drawings explain abundantly well the consequences of this depression of the head of the thigh bone. We see plainly, upon comparing the two broken bones with the outlines of the sound thigh bone, No. 2. placed betwixt them, how much the neck of the thigh bone, by losing its obliquity, loses of its length ; how much also, as in fig. 1. from Ludwig (one of the earliest writers on this interesting subject), the motions of the limb must be embarrassed by the projection of the trochanter ; and lastly, it must be remembered, that often, as in No. 3. the head of the bone is not only set lower down, but turned round, with regard to the shaft of the bone, as is explained in the following note concerning the case : “ *Femoris ossis sinistri pars superior est. Fractura colli adfuit obliqua, deorsum per partem corporis sese extendens. Partes sic concreverunt, ut caput loco admodum demisso conspiciatur et simul tantopere retrorsum recesserit, ut cæ partes ossis quæ sano statu a parte posteriore inveniuntur, nunc in parte laterali externa dentur.* ” — SANDIFORT.

PATHOLOGY OF THE DISEASED ACETABULUM, OR AFFECTION OF THE SOFT PARTS WITHIN THE HIP JOINT.

Luxation of the thigh bone is usually produced by a strain or twisting of the limb ; fracture of the neck of the bone is usually produced by perpendicular falls or leaps, in which one leg bearing, either directly or obliquely, the whole weight of the body, the stress falls upon the neck of the bone, which breaks across : but the disease I am now to describe proceeds from a fall upon the haunch, (as when the foot slips on ice, &c.) in which the trochanter being directly struck, the head of the thigh bone is beaten down into the socket, the round ligament, which occupies the bottom, and the mucous fringes, which are contained rather in the lower part of the socket, are violently bruised, whence arises immediate and very terrible pain, continuing for many months. The torture is excruciating, the patient cannot be turned, nor even moved, in the most gentle manner in bed ; after, perhaps, a year's suffering, he begins to move about upon crutches, entirely lame.

This disease of the acetabulum is peculiarly frequent in people advanced in years. We must impute their sufferings to the bruise of the soft and delicate parts which lubricate the joint. The consequences are very deplorable, for it is from this cause that we see so many old people lame and miserable for the remainder of their lives. It is almost peculiar to those advanced in years, because, during the active stage of life, the dangerous leaps and violent falls and strains of the limbs more frequently dislocate or fracture the bone ; and in such accidents, the head of

the bone being driven upwards against the upper and deeper part of the socket, the mucus, ducts, and soft parts, which lie in the lower part of the socket, suffer no harm. But, in old age, the slightest slip occasions a fall, the fall is upon plain ground, yet the fall is very heavy, for want of that agility and strength that might break the force of the fall, or change its direction; the haunch is struck, the blow is direct upon the trochanter, and the head of the bone is driven directly downwards into the bottom of the acetabulum*.

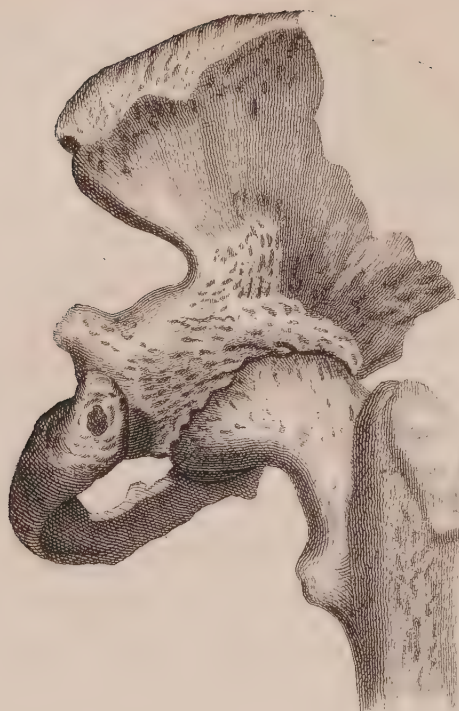
The disorder never can be confounded with any other. No one, who has in his own person suffered a blow on the knee or haunch, can doubt the sensibility of those parts within the joint which serve to lubricate it; and no one, who has observed the number of large arteries which enter into the knee joint, for example, at its sides or back part, or which enter into the hip joint under the ligament in the open part of the acetabulum, can doubt their vascularity or susceptibility of action. This accident then is attended with excruciating pain, and is clearly distinguished from fracture, because there is neither crepitation nor shortening of the limb; from luxation, because the limb turns easily; and from those and all other affections by this, that though it turns easily, and there is no mechanical obstruction to motion, the patient cannot suffer it to be turned, every motion of the head of the bone rolling against the injured parts of the socket producing delirious and frantic outcries. Sometimes this inflammation of the joint subsides, and, after long confinement and torture,

* From the awkwardness and entanglement of their clothes, such accidents are peculiarly frequent with old women.

perhaps after using warm baths, frequenting watering places, fomenting and gradually exercising the joint, the patient recovers the use of his limb ; but much more frequently he continues lame.

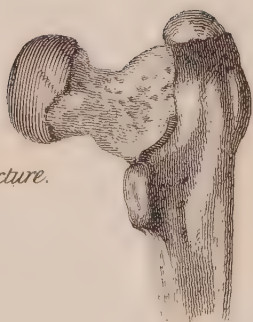
It is not difficult to imagine, and indeed to prove by dissection, various changes by which the joint is destroyed. The first effect of such inflammation and insufferable pain is, to produce a trembling solicitude on the part of the patient to prevent the slightest motion of the limb. The patient lies in all the filthiness of a sick-bed, will not permit a pillow to be changed, or a sheet to be rolled under him ; even the trembling of the floor, when people walk rudely, increases his irritability, if not his actual torture. This is almost a provision of Nature, for motion actually does harm, excites inflammation, brings the inflammation forward to abscess of the joint and caries of the bones, and prevents anchylosis, which is often the only possible cure ; the presumptuous interference of quacks with the process of Nature, their daring to twist and turn such a limb, under the pretext of reducing luxation, has actually proved fatal.

The stillness of the patient, like death, and the uniform posture for many months, favours all those changes which are apt to take place in a joint thus highly inflamed. Sometimes the inflammation stops short of ulceration, the capsule, tendons and membranes surrounding the joint, are merely thickened by the inflammation, and the joint remains stiff, rheumatic, but moveable, and, as far as pain will allow, useful. Sometimes, and especially in younger people, the inflammation runs high, abscess forms, and after repeated paroxysms of inflammation and most excruciating torture, the matter bursts out at the haunch,

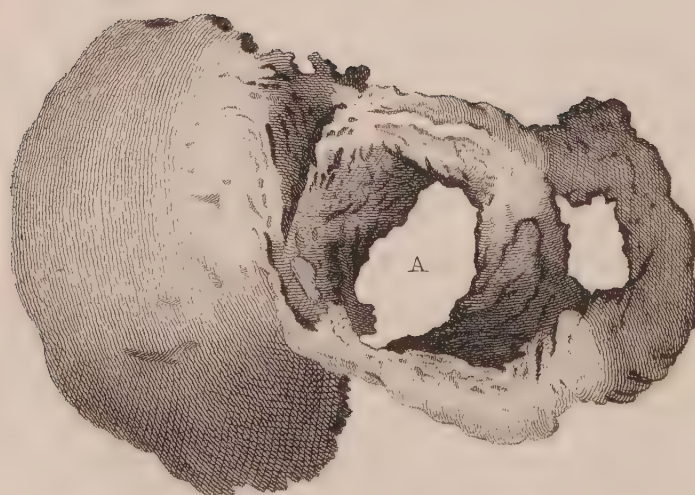


*Anchylosis with the
Thigh projecting forward.*

*Depression of the
Cervix without fracture.*



*Cap of newly
secreted bone.*



*A. Acetabulum destroyed by the
Scrofulous disease of the hip joint.*



*B. Head of the
Femur destroyed.*

or in the groin, with proportioned relief of pain. Often, you may suppose, before the matter thus bursts out, the bones themselves are ulcerated, the capsule is destroyed, the head of the bone is extruded from the acetabulum, and retracted by the force of its muscles upon the back of the haunch bone ; then the leg is shortened ; and this is what the ancients called Subluxation ; the French, Luxation Consecutif, and which has been by almost all surgeons acknowledged as a luxation under the title of, Luxation from an Internal Cause. Often the bones, thus eroded, become carious, and not unfrequently hectic ensues, and the patient dies.

If, escaping all those dangers, the patient live, and the bones granulate, they unite with each other ; for the persevering posture of the patient prevents the process of ossification being disturbed, more effectually than our most severe and curious bandages could do ; the bones unite with each other often in the most awkward direction, the thigh bone being fixed and united with the pelvis at right angles in respect to the body. But even, although the bones be not entirely eroded, I observe a very singular consequence to result frequently from the mere inflammation of the periosteum and bones, and it is this ; the bones thicken, there is a sort of exostosis, but flat and regular, a new lamella of bone is secreted under the periosteum ; and you will often see, in museums, the head, for example, of the thigh bone covered, as it were, with a cap of newly-secreted bone projecting over the neck, and almost touching the trochanter. Indeed, it does not seem to me that any thing is necessary to this regular and almost natural genera-

tion of bone but a slight degree of inflammation, and a fixed posture of the limb.

Once more let me observe, that I ascribe this disease to old people, because they are subject to those awkward falls, in which the great trochanter is struck; but let it be remembered, that sometimes in the aged the bone is broken, though very seldom luxated, by this blow. I also distinguish this as a disease of those advanced in years, because the aged are not liable to a peculiar disease of the bones themselves, which I shall now describe.

OF THE SCROPHULOUS DISEASE OF BOYS, OR THE DISEASE
OF THE BONES WHICH COMPOSE THE HIP JOINT.

The scrophulous disease of this joint is peculiarly frequent in boys from five to eighteen or twenty years of age, and is of that insidious nature, that its approach is hardly observed; the disease is established before its symptoms are noticed, even by the most affectionate and attentive parents, and it ends in total caries of the joint, with ankylosis or cohesion of the diseased bones, though often, from the suppurations and dreadful pain, hectic and death prevent this imperfect cure. The bones, and not the soft parts, are the seat of the disease, therefore its progress is very slow; the pain is so dull, that the boy walks and runs about for months after the disease is formed. The parents first observe an awkwardness and trailing of the affected limb, as if it were weakly; the boy complains little except of weariness after play, and of that numbness and stupor, with dull and

heavy pain, which the parents mistake for growing pains, so frequent in boys.

The boy now begins to stand always on the sound limb, and in such a posture, that the parents chide him for awkward habits. After sitting a little while, his joint stiffens, when he returns to play, he begins to feel pain, when he is warmed with exercise, the joint moves more easily, and he runs his race with his play-fellows; but, when his bout of exercise is over, he falls again into a state of languor. The limb seems weakly, and begins to waste, the boy loses his health and complexion, from day to day he complains more and more of pain, till at last he is confined, and a puffy swelling appears about the joint.

During all this stage of the disease, the bone is swelling and becoming more vascular, the lining of the acetabulum and the periosteum covering the head of the thigh bone, are thickened in common with the bones themselves which are now swelled. The head of the thigh bone is protruded in some degree from its socket, just as a diseased tooth is protruded from its socket by a bag of suppuration forming under its fangs, by which the tooth is not only apparently, but actually, longer than the adjoining teeth. Still the disease is limited to the bones; there is not, as in the disease arising from bruises of the acetabulum, excruciating acute pain, although the leg be remarkably elongated, so as to straddle away from the body, though it appears so elongated, from the twisting of the pelvis, that when the boy stands on the diseased leg, the toes only of the sound one touch the ground, yet he is almost without pain, and walks with a degree of ease. Exercise, or the common degree of motion, during this stage, is not so difficult

on account of pain, as imprudent, from its increasing that affection of the bones which unhappily is too late of declaring itself by acute pain.

But at last the stage of acute pain does come ; the boy becomes unable to move, the pain becomes very acute, the soft parts which connect the bones begin to partake of the inflammation ; there is redness now, as well as swelling, round the haunch. The pain is often, though not always, excruciating ; abscesses form round the joint ; the matter bursts out, first at the groin, then at the hip. As the abscesses give vent to the matter, the torture is in some degree relieved, as one sinus or ulcer dries or closes up, another runs more plentifully, or new abscesses form. Then the cartilages are ulcerated, the matter which had distended the capsule is evacuated, and the swelling of the parts within the acetabulum, which had in some degree extruded the head of the bone from its socket, subsides, the head of the bone falls down again within its acetabulum ; the limb, remarkably elongated at first, is shortened in this second or suppurative stage of the disease.

The cure of the disease is now to be looked for, or the patient's death. The patient, originally a puny boy, confined from play, wasted with suppuration, and tortured night and day with excruciating pain, becomes greatly extenuated ; he is reduced to skin and bone, he is pale and cadaverous, in the face, the nose is pinched, the eyes starting from their sockets, and the face altogether shrunk and shrivelled up with discontent and pain. Often, the suppuration and caries extending along the bones, the whole pelvis is affected, the discharge is profuse, and the child dies of hectic ; but sometimes the matter ceases to flow,

the high inflammation subsides, the bones begin to granulate within like soft parts (as they indeed are in the boy extremely vascular), and, by perseverance in one uniform posture, the bones unite, a proper ankylosis is formed, smaller suppurations are occasionally observed and opened, till at last the bones, after successive fits of inflammation, are entirely united with each other. The thigh bone is generally united with the haunch at an angle more or less acute, according to the posture which the child had found the most easy ; frequently it is found, when the boy begins to walk with his crutch, that the thigh protrudes forwards ; sometimes it is in the natural direction of the body, but even then the limb hangs in air, it is enervated by want of exercise and by disease ; the diseased limb has been stationary in its growth for eighteen months, or two years, while the other limb and the rest of the body have been growing ; thence the affected limb is always shortened, and often useless.

This is the short and simple description of a melancholy and frequent disease, the chief peculiarities of which, as arising from the peculiar conformation of this joint, fall next to be explained.

In such a disease, parents would fain deceive you, often they deceive themselves ; it never is ascribed to any constitutional affection, but to a fall or blow in a rambling schoolboy ; or, in a younger child, to the carelessness of a nurse. This is a mere deception ; the curvature of the spine, for example, is always ascribed to some blow or fall ; the spine bends outwards, one of the vertebræ becomes pointed, a particular tumor appears : it is very natural for the parents to imagine that this has been occasioned by a blow, and to accuse the nurse ; but the surgeon

knows that the curvature of the spine is an internal and a constitutional disease ; it is an ulcer succeeded by a caries of the vertebræ ; it is the body of the vertebræ (not of one indeed, but of several vertebræ) that is affected ; the intervertebral substance and the ligaments are ulcerated, the bone itself is carious, the wasting of the vertebræ on their fore part makes them fall nearer each other, and it is because the vertebræ are sound behind that they preserve their natural size, and bulge outwards, while the bodies of the vertebræ are ulcerated within. Thus a disease is usually ascribed by parents to a blow, which we know, by innumerable dissections, is actually produced by an internal ulcer ; the surface of the bone supposed to be struck is, in fact, the only part remaining sound. What rambling schoolboy can escape blows and falls ? yet the most desperate blows are followed by no ill consequence, except in those predisposed to disease.

Diseases of the bones and joints then are peculiar to boys of a scrophulous constitution ; to boys who have a fair complexion, grey eyes, light hair, and a transparent redness of cheek ; a swelled mouth, and puffy face, a large head, a tumid belly, clumsy limbs, with soft flesh, which feels like wool ; for scrophulous boys, when not under actual disease (then they become shrunk and pale) have a big and fleshy body, and rosy countenance, which any uninformed person would mistake for marks of uncommon health and vigour.

This indescribable whole, which the physician easily distinguishes, indicates a lax and weakly system, the foundation of many diseases ; the bowels and glands are especially apt to suffer, but the bones most of all. The scrophulous habit seems to consist in lax-

ness and debility, in an imperfect action of the arteries, in an imperfect secretion of the solids, and especially in an imperfect secretion of the bony matter ; for, in all stages of life, but especially while the bones are forming, the bones suffer in various ways by this disease, which appears sometimes in the form of rickets, in which the secretion through the bony system, being imperfect, the bones bend, and are distorted, under the weight of the body ; sometimes under the form of necrosis, in which the whole shaft of a bone dies, and is expelled through the abscess which its death occasions, while, by the activity of the surrounding parts, a new bone is forming, the dead being discharged piecemeal ; and very often the general disease shows itself in affections of the great joints ; such as we are now explaining.

You will observe, I say, the “ great joints,” by particular design, for they only are affected. It is not from a blow or fall that the scrophulous disease proceeds, else we should easily trace it to its cause. It could indeed be no equivocal blow that could produce such a disease ; we should find the disease as frequently in the wrist, the elbow, the shoulder, as in the joints of the lower extremity. But it may be that the disease is peculiar to the articulations of the lower extremity, because they support the whole weight of the body. No, for the ankle is rarely diseased, though it bears more weight than the hip or knee, and is fully as liable to twists, sprains, and blows. It may arise then from the injury or disease of the soft parts, since those joints are very complicated. No ; for fractures, luxations, even bruises of the acetabulum, do not, either in adults or in healthy boys, produce disease.

The joints peculiarly subject to scrophulous affections are the spine, the hip, the knee. The knee is diseased less frequently, because, though it bear all the load, and be in continual motion ; though its bones, especially the heads of the tibia and thigh bone, be large and somewhat spongy, they are yet completed pretty early in life, and are comparatively firm and compact. The hip is very subject to disease, because its acetabulum is formed in the centre of three of the largest and most spongy bones in the body, the joining of which is exactly in the centre of the acetabulum, and remains actually cartilaginous till the twentieth year. There is in the pelvis a great mass of bone to form, and it seems that till years of manhood it remains very imperfect ; now, it is neither in the soft parts, in the central ligament, nor in the thigh bone, that the disease begins, but in this acetabulum*. The disease of the spine is the most frequent of all, because the spine, while it supports the whole weight of the body, turns with the slightest inclination of the trunk, and consists of the most spongy

* I have reason to believe, that often the acetabulum being entirely destroyed, the head of the thigh bone still entire passes through the hole up to that point at which it is naturally stopped by the trochanters. Ludwig, not observing how very liable this part is to disease, nor indeed perfectly acquainted with the scrophulous caries of the hip joint, imagined, that sometimes the head of the thigh bone, by the force of a fall upon the trochanter, was driven through the centre of the socket at the place where the bones are joined by their intermediate cartilage ; but I shall spare my conjectures, and enable you to make your own, by laying before you the text of Ludwig. "*Aliter quam hoc in casu violentior impetus, femoris collo et acetabulo in puero novem circiter annorum illatus articulum mutavit. Ossa coxarum quæ nondum coaluerant in illatæ facile cedebant et ilium non nihil antrorsum et introrsum flexum inveniebatur,*" &c. But the whole description of the case corresponds with a disease which I shall describe presently, viz. the scrophulous caries of the hip joint, for the head of the thigh bone had coalesced with the acetabulum, &c.

bones, and it is in the most spongy part of these bones, in the fore part or body of the vertebræ, in that part in which the church-yard bone seems so porous, and which in the living body is almost as vascular as flesh, that this disease begins; and the matter, making its way from the carious vertebræ along the loose cellular substance at the loins, appears at the groin forming the lumbar abscess; for the lumbar abscess is the same disease with caries of the spine.

The joints of the vertebræ, the knee, the hip, as they are the largest and bear the whole weight of the body, are the most complicated with ligaments and lubricating apparatus, so that, by being the strongest in the actual form of their bones and muscles, they have a peculiar delicacy of constitution, and are the most susceptible of disease. Upon those three joints then does the whole force (if I may so express myself) of this disease fall.

First, That this is a disease of the bones, we are well assured from the lingering nature of the disease, the little pain with which its first stage is attended, the period of life at which it occurs, and from boys and parents mistaking it for growing pains, for I have examined those carefully who have the mollities ossium, or the necrosis of the long bones, diseases which are always described by the patients as “dull and heavy pains of rheumatisms in the bone.”

Second, The pains are dull because the bone is insensible, the disease slow because the firm system of a bone does not easily enter into disease; the elongation of the joint is a sure sign that the disease is established, and the head of the bone, the socket and the soft parts beginning to swell; the excru-

ciating pain demonstrates that the soft parts are fully inflamed and ulcerated, and that to the original disease of the bone is now added a disease of the surfaces, such as takes place after the bruise of the acetabulum ; and finally, the shortening of the limb intimates to us that the bones are wasting, which is often confirmed by small fragments and scales of bone coming away along with the matter. Finally, When the matter ceases to flow, the fistulas to close, the limb to shorten still more, and the pains to subside, then the bones come into actual contact, granulate, unite, and anchylose firmly in due time ; for the hectic ceases, the appetite returns, and the cure goes on well, if only the patient can survive the degree of debility already incurred.

Third, This final destruction of the joint is the ordinary issue of the disease ; for, where the bones are once thoroughly diseased, they are in general carious, or in other terms, dead, or (as we should say of soft parts) gangrenous to some extent. The carious part then must be separated ; the bones which enter so slowly into disease, must of course recover slowly ; but, besides the extent of surface, the disease is attended in its first stage with so little pain, the patient walks so long while the disease is forming, and the joint bears so entirely the whole weight of the body, that, being once diseased, it cannot easily recover ; it is indeed entirely ruined in its structure almost before the disease is observed.

Fourth, The cure in the bruise of the acetabulum is leeches, fomentations, blisters, general bleeding, and perfect quiet ; but, in this scrophulous disease of boys, the cure is best conducted by bathing, generous food, wine, and whatever will contribute to the re-

storation of the health and strength. The immediate progress of the disease is best antagonized by the counter irritation of blisters, or rather of deep and large issues upon the hip, or by the application of cauteries (the oldest and perhaps the best method of cure), along with prudent openings, and careful but unofficious surgery. But the object of chief importance in promoting the anchylosis is to prevent motion, for even the weight of the limb is very painful, the very turning in bed inflames the part and interrupts the process; and quacks, by turning and twisting joints during this process (the patient being in a fair way of being cured), have caused death.

Fifth, When the disease cannot be prevented from going on to the suppurative stage, the consequences are, abscess of the joint, hectic fever, bursting outwardly of various abscesses and unavoidable anchylosis. But let it not be supposed that anchylosis is the peculiar consequence of this disease, it proceeds occasionally from every affection of the joint, and sometimes even exists independent of disease. It is produced sometimes by luxation, the head of the thigh bone being placed upon the back of the haunch bone, the nourishing membranes of both bones lacerated and excited to granulate, and the bone being kept steady in this unnatural posture from fear of pain. Sometimes anchylosis is produced by fracture, the broken neck of the thigh bone being lodged close upon the back of the haunch bone among the lacerated parts. Sometimes it is produced by the bruise of the acetabulum, followed with inflammation, pain, and ulceration within. Still it must be acknowledged, that this scrophulous disease is by far the most fre-

quent cause of ankylosis. We perceive then that the effects of disease upon this joint are never limited by the first cause, that the effects of disease are very irregular ; that the surgeon cannot know what is going on within, without being acquainted with every possible affection of the joint.

Sixth, During all this process, there is not that subluxation, that displacement of the head of the bone from an internal cause, which was supposed ; there is never that entire displacement which Mr. Petit supposed, when he asserted that the head of the bone falling into the sciatic notch pressed there upon the sacrosciatic nerve, and produced paralysis by the pressure. Petit formed a very ingenious theory to explain how the head of the thigh bone might be retracted so as to shorten the limb without being displaced from its socket, whereas he should have been employed in explaining how the thigh bone can be elongated, without the head of the bone being in any shape displaced either by being retracted or by being extruded from its socket ; for we now perfectly know, that during that period of the disease in which the limb is elongated, the head of the bone actually never is luxated, it is right and fair in its socket, though both the head of the bone and the socket are swelled ; it is indeed so fairly within its socket, that at the very time of its greatest elongation, when the toes of the sound leg can hardly touch the ground, the patient walks, and that pretty firmly too, upon the lengthened limb.

Seventh, When the period of ulceration, granulation, and healing of the bones arrives, a remarkable, but very gradual, shortening of the limb takes place,

because the bones must first be ulcerated, then fall into closer contact, then granulate, and then adhere, before the ankylosis is complete.

Eighth, When such a suppuration and caries, beginning in the bones themselves, does happen, not in boys, but in adults, not from any constitutional disease, but from a blow, the blow is in a very particular direction, and affects only the bone; for it is not a blow upon the trochanter striking the head of the bone downwards, so as to bruise the soft parts at the bottom of the acetabulum; but it is by a person making a desperate leap and lighting fair upon the feet, for the head of the thigh bone is then struck upwards against the deepest part of the acetabulum, where the Os Innominatum is particularly large and firm! the bone only is bruised, there is no immediate pain, the lameness comes on slowly, and the disease usually makes very slow progress to suppuration, and caries, and hectic, and death.

CONCLUSION.—This then is a disease which has been known in all ages and in all climates, and authors have from time to time noticed it, but not with that fixed attention which so important a matter deserves. The older authors may have been inaccurate in names, and (what is more to be lamented) careless of those distinctions which are so necessary and useful in practice; but the phenomena of a disease so very remarkable as this could not escape their observation. This is the consecutive or secondary luxation of the French authors; and when the celebrated Sabattier, proceeding to describe the consecutive luxation, begins thus, “I was consulted for a girl of thirteen years of age;” we are sensible even

by this, that he is going to describe a scrophulous disease of the hip joint, and his description confirms the suspicion raised by the tender age of his patient. The celebrated Petit, who was indeed the first who described this disease with accuracy, is in fact employed in writing an elaborate essay on the hip disease without knowing it. In short, the French surgeons, from their loose and vague manner of writing, introduced great confusion into this department of pathology ; they first confounded luxation with the bruise of the acetabulum, which they described as a consecutive luxation ; and they next confounded this bruise of the acetabulum or consecutive luxation with the scrophulous disease of boys. This hip joint disease is the *atrophia post ichorem et meliceriam acrem articularum exulceratorum*, of Hildanus, whose description of the consequences of this disease, and of the manner in which the joint becomes ankylosed, is curious and accurate.

DIAGNOSIS OF THE VARIOUS ACCIDENTS AND DISEASES OF THE HIP JOINT.

First, In the perpendicular posture of the body, when the pelvis rests fairly on the head of the thigh bone, the neck of the thigh bone bears its full share of the weight ; and in falling from a height upon the feet, or in dropping from a window, or in falling with force upon one knee, or in taking a high and dangerous leap, the whole weight of the body strikes upon the head of the thigh bone in a direction transverse to that of the neck. The resistance of the ligament from below, and the deepness of the socket

above, prevents luxation upwards, and the neck of the bone breaks across. A blow in this direction, then, may fracture the neck of the thigh bone, or may so bruise the socket, as to produce a disease like that of boys, but can never hurt the lubricating apparatus, which is safely lodged where no pressure is.

Second, A fall in which the foot slips inwards, the limb is twisted, and the body falls on one side ; in short, when the thigh is distorted, the head of the bone is more frequently twisted out of its socket, and luxated upwards ; the great capsule of the joint is burst ; the central ligament is torn up by its root ; and the head of the femur is lodged on the back of the haunch bone, or in the sciatic notch.

Third, But when the person slips his foot, so that the inside of the ancle slides along the ground, and that the limb is twisted outwards ; or when, having a heavy burden on his back, he falls, so that the inside of the knee strikes the ground ; or when, as in laying a sack of corn from his back upon a cart, he makes one step away from the cart, and the sack falls upon his extended leg, so as to twist the limb outwards ; the head of the thigh bone is turned downwards towards the lower part of the socket, and is easily luxated in that direction, because there the socket is imperfect, its border is low, and guarded only by a ligament (the *ligamentum labri cartilaginei*), while the central ligament prevents only luxation upwards, because its root arises near this lower border of the acetabulum.

Fourth, It is very obvious, that when the thigh bone is struck inward by a fall upon the trochanter, its head is beaten down into that part of the socket

where the mucous ducts lie, and these soft parts are bruised, whence comes immediate and dreadful pain, high inflammation in the joint, and sometimes supuration and caries of the acetabulum, followed by ankylosis.

Fifth, When the great trochanter is struck obliquely from above downwards, any of all those accidents may ensue, for the head of the bone is struck so downwards into the socket, that very frequently the mucous ducts are injured ; or being struck thus obliquely, the head of the bone may be luxated downwards, by being driven over the border of the acetabulum at its shallowest part ; or, finally, by being struck thus obliquely, the neck itself may be broken.

In enumerating these consequences, it is to be observed, that the effect of no particular blow is absolutely limited, while yet it may in general terms be affirmed, that luxation is produced by a twist of the limb ; fracture of the neck of the thigh bone by a desperate leap, or fall from a height ; while falls in which the trochanter strikes the ground, though they do sometimes luxate or fracture the thigh bone, more commonly injure the acetabulum and its lubricating apparatus. It must be matter of wonder, indeed, how, since the soft parts within the socket are so easily injured, they ever escape disease in any of the common accidents of the joint. But it is to be observed, first, That the bone is luxated or fractured by blows or twists, which tend rather to turn the head out of the acetabulum, than to drive it down into the cavity. Secondly, That the mere laceration of an internal part, as of the central ligament, heals very easily ; for in every case of luxation it must be

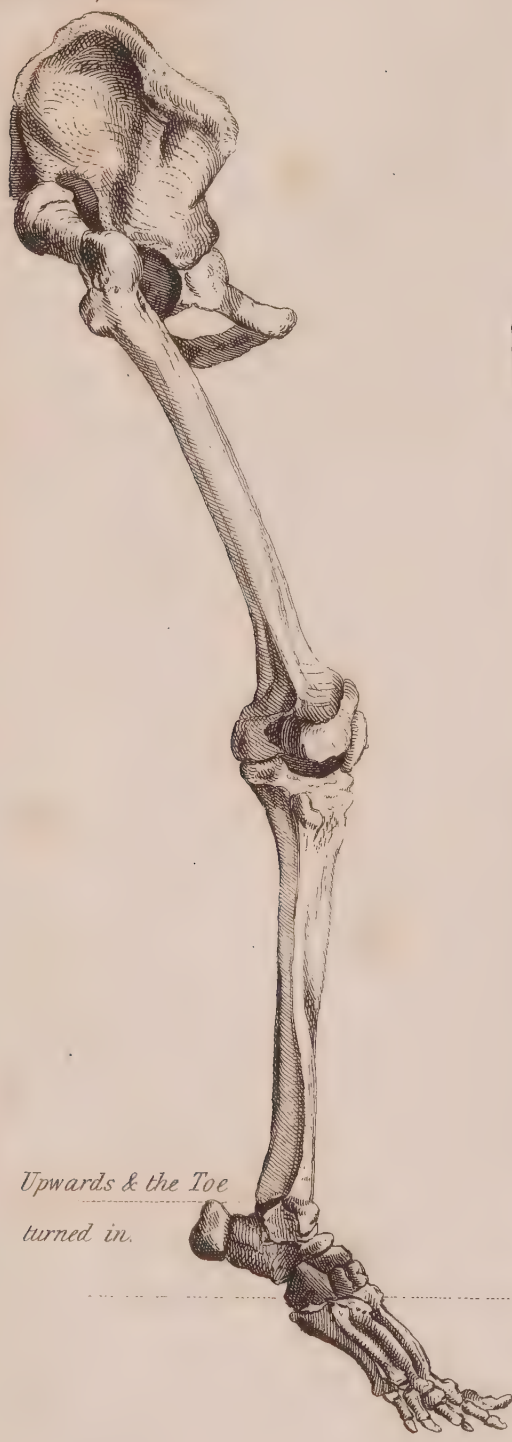
torn, and yet no disease ensues. Thirdly, The actual fracture or luxation produces no disease, because that peculiarity of constitution is wanting which produces in boys the most dismal consequences from the slightest accidents, not in this joint only, but in all the joints. And, lastly, We find that even when, in consequence of inflammation arising from mere local injury, the bones do inflame and throw out callus, it is a healthy inflammation like that of a granulating wound, and stops spontaneously as soon as the callus is formed, and the reunion of the neck of the thigh bone, or the formation of the new socket completed.

Till the various accidents of the hip joint be accurately defined, a surgeon cannot know what appearances are to be contrasted (although, to distinguish any one accident of the hip joint, he must know and remember every accident); till the causes be described which occasion those various accidents, he wants the key to the proper inquiries; and, finally, till he has before him some sensible representation of the posture which the limb assumes in each of those accidents, he must argue but very incorrectly! It is for these reasons that I have drawn out for you a second set of plans, in which the whole length of the limb is represented. When the patient has had his limb violently twisted, perhaps, under a heavy load, we suspect luxation; when he has taken a dangerous leap, and fallen to one side; or when he has fallen upon one knee, and the hip joint is hurt, we suspect fracture of the neck of the bone; when the trochanter has been struck with immediate and violent pain, we suspect rather an injury of the acetabulum. But the actual condition of the limb may be ascertained by the following marks:—

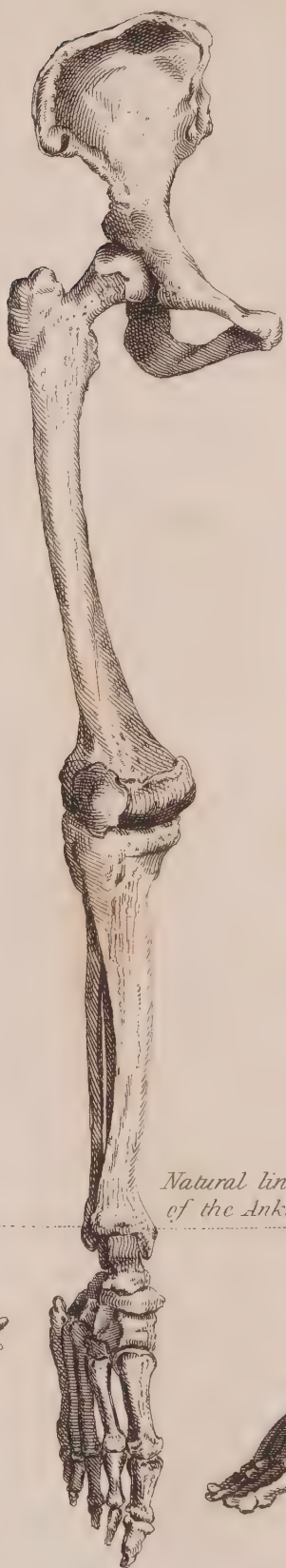
Luxated upwards.

Natural.

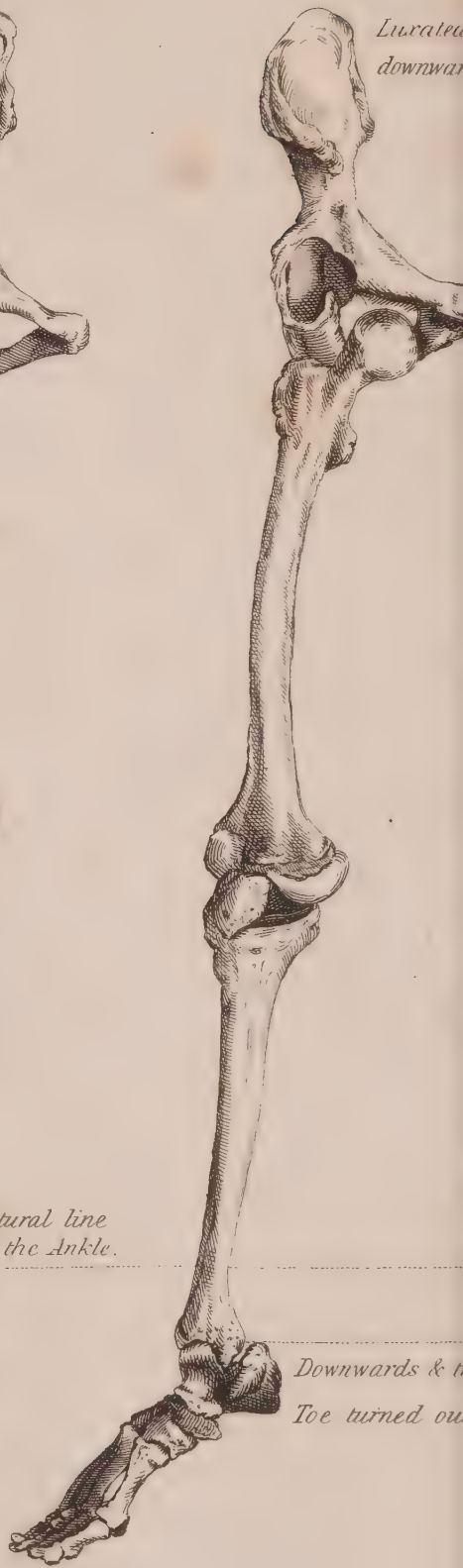
Luxated downwards.



Upwards & the Toe turned in.



Natural line of the Ankle.



Downwards & the Toe turned out.

thigh bone is lodged under it, and lies pressed against the back of the haunch bone ; the head of the luxated bone looks backwards towards the sciatic notch, and sometimes lies fairly lodged within the sciatic notch, so as to cause a numbness of the limb by its pressure against the sciatic nerve. The effects, then, are as follows :—The whole posture of the limb is not slightly but very unequivocally distorted, the head and neck of the thigh bone are firmly braced down against the back of the pelvis by the surrounding muscles, whence the limb, which lies in a very awkward posture, is absolutely immoveable. The head of the bone having started fairly over its socket, and lying even as high as the sciatic notch, that is at the distance of three or rather four inches from its natural situation, the limb is very remarkably shortened ; for when the thigh bone thus rises four inches, the heel of the luxated limb is opposite, not to the heel of the sound limb, but touches it a little higher than the ancle, and, indeed, in the distorted posture in which the patient lies, the heel of the luxated limb is nearly opposite to the middle of the sound leg. Next, the whole limb is singularly distorted, the toe is turned inwards, and the heel outwards, and the knee of the luxated limb falls in behind the thigh of the sound one, and in this awkward posture the limb is so immoveably fixed, that when you attempt to turn the thigh bone, you give great pain ; in the moment of the attempt, you are sensible of insuperable resistance ; indeed, if you could turn the thigh bone, you would reduce it.

Now, when the limb is thus luxated upwards, if you lay your patient on his belly, you will find the leg half bent, and standing up at right angles with

the thigh ; and taking the leg in your left hand, and working it like a rudder backwards and forwards, laying your other hand, at the same time, flat over the haunch, you will be sensible, every time the thigh bone is turned, of the ball, or head of it, turning under your hand ; and when you persist in turning it very largely and rapidly, you will be very sensible of the head and neck of the bone clucking against the haunch bone. But of all the marks, none is more particular than this, that the great trochanter rises very high, the prominence which we call the haunch seems to be transferred very high up upon the hip, the thigh is remarkably shortened and flattened, and when you first begin to roll the thigh bone, and to feel the joint, you would be apt to mistake the trochanter for the head of the bone, and the clucking noise of the luxated bone for the grating of a fractured one.

Third, When the thigh bone is luxated downwards, the capsular and central ligaments are lacerated, the obturator muscle, which fills the thyroid hole, is in part torn up from its origin, and the head of the bone is lodged in its place ; the turning, or rotation, of the thigh bone is in this luxation, also, entirely prevented, by the awkward posture of the neck ; the head of the bone looks forwards, or rather upwards, and the limb is as much fixed as when luxated upwards.

All the peculiarities of the distortion first described are reversed in this luxation ; the head of the bone is now lodged in the thyroid hole, a part of the pelvis lower than its natural socket, that the leg is lengthened. The head of the bone, in this luxation, looks forwards and upwards, so that the toe which was

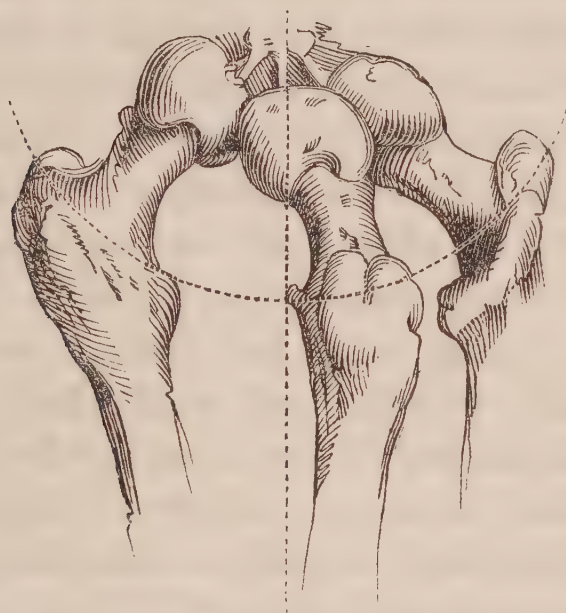
turned inwards in the luxation last described, is turned outwards in this; and the head being now turned forwards, the knee, which in the upward luxation lies under the sound knee, is in this turned remarkably outwards, while the whole limb is kept, in a very remarkable manner, straddling away from the body. In the luxation upwards, the head of the bone is less distinctly felt, because the trochanter is apt to be mistaken for it, the head and neck lying deep under the glutæi muscles, whereas in this luxation, the head of the bone is felt rolling very distinctly and superficially in the groin, for at this point the joint of the hip is not covered with large muscles, such as the Glutæi, but with one thin and flat muscle, the Pectineus, and the joint is so near the surface here, that the suppuration in the hip-joint disease usually bursts first in the groin.

Fourth, The peculiar signs of fracture of the neck of the thigh bone are not less decisive. The moment the neck of the thigh bone is broken, the bone is retracted by the power of its muscles, it is turned somewhat round by the rotatory muscles (the Obtur. Internus quad. Femoris, &c.) operating upon the shaft of the bone; and while the head and neck of the bone remain in the socket, the broken part of the bone at the root of the trochanters mounts upwards. The following signs, then, must follow those peculiarities in the posture of the bone:—First, the moment the neck of the thigh bone is broken, the shaft of the bone is so retracted by the power of its muscles, that you would imagine the bone to be luxated upwards. Secondly, observing next the posture of the leg, you find that the toe is not turned inwards, nor the knee of the hurt limb bent

in under that of the sound one, nor is it turned outwards in that fixed, awkward, and straddling posture which indicates luxation downwards, yet it is turned outward. Thirdly, you next begin to turn the limb, and to hearken for crepitation; but you will remember that this fracture is distinct from all others, in having no crepitation, for the ends of the broken bone are not opposed to each other (as where a bone is broken across its middle), but the broken neck of the bone remains in the acetabulum, while the part (i. e. the root of the trochanters) where the neck of the bone was broken away from the shaft is so retracted, that the fractured parts are never opposed to each other, unless, indeed, in the moment of extending the limb with the design of setting the fracture, for then the limb being drawn out nearly to its natural length, the fractured parts come to be opposite to each other, and the crepitation is distinguished. Fourthly, it is to be observed, that the limb cannot be fixed and embarrassed by the neck of the thigh bone, as in luxation; the connexion betwixt the head and shaft of the bone is destroyed; the limb is not only free, but were it not for the spasmodic contractions of the muscles it would be absolutely loose! the natural thigh bone moves easily, but the broken thigh bone turns loosely, as far as a bone can turn loosely which is encumbered with such a mass of muscles lying about it.

This also is very particular, it turns vertically like a spindle. If you take in your hand a sound limb, with the design of turning it, and lay the palm of your hand over the trochanter, you will be sensible that the bone moves slowly and steadily, because it is connected with its neck. The head of the bone is

the centre of motion, the trochanter is at the distance of three inches from that centre, and moves in large circles, of which the neck of the thigh bone is the radius ; but when the shaft is broken away from the neck, the shaft of the bone is itself the centre of motion ; the trochanter, of course, turns vertically in its place without making any circle, it merely turns like an axis.



The fracture of the neck of the bone then is easily distinguished from luxation, by the ease with which the limb is turned, by the thigh bone turning vertically upon its axis, by the leg being much shortened, easily lengthened by extending it, but very difficultly retained. But though I affirm that the thigh bone is easily turned and moved in various directions, I mean so only in reference to the mechanical resistance, for it is not moved without dreadful pain ! the ragged trochanters, and broken part of the bone, are lodged among the soft parts, and every time you try to draw

the leg outwards, the patient suffers dreadful pain from the pressure of the broken part of the femur against the lacerated parts which lie on the back of the haunch bone; thence it is, that the patient is no sooner laid in bed than he inclines the knee inwards, and distorts the limb, in order to raise the broken end of the bone, and prevent it pressing against the lacerated flesh.

This last observation reminds me of the necessity of explaining two doubtful points in the diagnosis; first, it is not certain that the toe is always turned outwards; secondly, it is not certain that the limb is always immediately shortened. You may have observed, that Paræus describes the toe as turned inwards, “*La jambe court et son pied tourné en dedans.*” Petit, also, in his *Maladies des Os*, mentions, that being called to a patient under the care of a surgeon who had not read Paræus, and who mistook the nature of the injury, “he found, upon undoing the bandages, the great trochanter four inches higher than its natural situation, and the toe and the knee turned inwards*.” Now, although Mr. Petit is here plainly narrating a case, and reporting a very certain fact, he is accused of merely copying what is considered as a blunder of Paræus! and the most celebrated surgeons, as Louis Sabattier, and others, plainly affirm, that the toe cannot be turned in. But it should be remembered, that the ease with which the thigh bone turns vertically, or, in other

* “*L'appareil étant défait, je sentis le grand trochanter quatre doigts plus haut qu'il ne devoit être, ce qui, joint à ce que la pointe du pied et le genou étoient tournés en dedans, me fit croire que l'os étoit luxé en haut et en dehors; mais, ayant pris le pied, j'en tournai la pointe en dehors sans résistance, et je reconnus par là qu'il y avoit fracture au col du fémur.*”

words, the ease with which we turn the toe outwards or inwards at pleasure, is among the most decisive marks of this kind of fracture ; that though the toe is naturally turned outwards by the action of the rotatory muscles, yet we can easily turn it in ; this implies that the patient himself can turn it in ! He often does turn it in, that he may lie with greater ease ! and accordingly you will often find the patient lying with the toe turned in, and the knee of the hurt limb turned under the knee of the sound one, for in this posture the fractured part of the bone is lifted up from the lacerated flesh. In short, there are two postures of the limb ;—first, That which it takes while the parts are insensible immediately after the accident ; secondly, That which it is instinctively put into for ease after the patient is laid in bed. But though the posture of the limb comes thus to be nearly that of a luxated thigh, viz. the limb shortened, the toe turned in, the one knee falling under the other, yet still fracture is easily distinguished from luxation, by the mobility of the limb.

Secondly, There is one point more in which there is a degree of uncertainty, for the most decisive symptom of all is sometimes wanting, I mean the shortening of the limb. The shortening of the limb in fracture of the neck of the thigh bone is not, as in luxation, the unavoidable effect of the posture of the bone ; it is an accidental consequence of the contraction of the muscles, and sometimes these are so benumbed by the injury, or so inactive from some other cause, that they do not pull up the thigh bone. Even though we were less able to explain the fact, we are not less constrained to receive it ; it stands upon record. Sabattier has, in consultation with

Louis, Foubert, and Goursoud, seen, on several occasions, the neck of the thigh bone broken, the limb remaining of its usual length, and the retraction happening suddenly, from the patient being turned rather rudely in bed by the helper of the hospital. Sometimes this retraction has taken place on the fourth or fifth, sometimes not till the twenty-third day after the accident.

This retraction after the accident has happened repeatedly in the Middlesex Hospital. A patient walked into the Hospital, in whom there appeared no fracture and no shortening of the limb, and yet afterwards, and by turning in bed, the limb became shorter, and the neck of the femur obviously fractured*.

Yet here there must be a deception, when Sabattier tells us of a boy of fifteen years of age, who, after receiving a blow upon the trochanter, walks home, feels pain next morning, lies two months in bed, and after that has a shortening of the thigh†; and more especially, when he tells of another who continued to walk about for two months after the accident, what are we to understand but that it is very possible to confound the injury and caries of the acetabulum, with the fracture of the neck of the bone? this but confirms the remark I hazarded in opening this subject of the diagnosis, that we can trust none of the

* I must observe, however, that not only do I conceive, from the course and attachment of the muscles, that the toe must be always turned out in fracture, but, in fact, I have always seen it so turned out.

† Un jeune garçon de quinze ans se laissa tomber entre deux pieces de charpente sur lesquelles il marchoit il sentit une légère douleur à la cuisse gauche qui ne l'empêcha pas de regagner à pied et sans boiter sa maison, distante d'environ deux portées de fusil.
Page 638.

facts that are affirmed even by the best modern writers on this subject.

CONCLUSION.

The disorders which need to be distinguished from each other are fracture, luxation, bruise of the acetabulum, and the scrophulous disease of the joint; and the chief signs are, the length of the limb, the direction of the toe, the place of the trochanter, the elongation or shortening of the limb, and the manner in which it turns when moved by the surgeon.

First, We are assured that the thigh bone is luxated downwards, when the accident has been a twist of the limb, or a blow upon the very top of the great trochanter; when the thigh is distinctly elongated; the toe turned outwards, in a splay-foot posture, and kept straddling away from the body with great pain. This luxation is accompanied with a proportioned displacement of the great trochanter; the hip is flattened, and in lean people you can distinguish the head of the bone rolling in the groin, though not in fat subjects, nor in women whose pelvis is broad and flat.

Secondly, We distinguish luxation upwards by the remarkable shortening of the limb, by the ham being crooked, the knee of the luxated side turned close in under the thigh of the sound side, and the toe turned inwards, or almost backwards. The great trochanter rises very high, and the thigh is flattened in this case as much as the hip is in the last mentioned. The patient lies on his sound side almost on his face, and when you take hold on the leg which stands up, and

begin to turn it, you, by laying your hand over the most tumid part of the haunch, feel first (because it is the most prominent point) the rolling of the trochanter, and then by carefully examining and turning the thigh bone, you at last distinguish the head of the bone.

Thirdly, When the neck of the thigh bone is fractured, the limb is remarkably shortened, the trochanter is higher than its natural place, the thigh is flattened, the pain is exquisite, and the toe and knee turned out; the moment you take the limb in your hand, you distinguish this from all other accidents; for while the limb is so remarkably shortened as to leave no doubt of some very essential injury having happened, it yet turns so easily as to prove that it is not luxated, and, indeed, it turns so loosely as to prove that the limb has not that degree of steadiness which the natural connexion of the shaft of the thigh bone with its head and neck should give. The limb is shortened, but is easily lengthened; the toe is turned out, but is easily turned in again; in short, the manner in which it moves will satisfy you at once that the shaft is separated from the head of the bone. If crepitation be not among the immediate signs of this fracture, it is because the bones are not, as in other fractures, opposed to each other; if crepitation be felt afterwards, it is only when the limb is extended, and the bone set, or in other terms the broken parts regularly opposed to each other.

Fourthly, When the patient has fallen upon the trochanter, or received a blow; when the head of the bone has been struck down into the socket with violent pain; when the patient becomes instantly

lame, and lies in a crooked posture, with the knee of the injured limb bent in under that of the sound (in order to raise up the head as much as possible from the inflamed socket, where its pressure occasions pain); when, along with these appearances, we are perfectly sensible that the limb, though crooked, is not shortened; when we find, that though when moving it occasions dreadful pain, yet it does move easily and steadily, we may be assured that the fall has occasioned merely a bruise in the acetabulum. In this case, the patient lies crooked in bed, the spine takes a curve, the pain is exquisite, the patient cannot bear to have the joint touched, or the limb moved; the slightest motion is terrible to him; to stretch out the limb is excruciating. The surgeon has not leave to handle the limb freely, or is prevented by his own timidity, and by the shrieks of the patient; he mistakes the nature of the injury, makes cruel attempts to reduce a bone which is neither fractured nor luxated, and does essential injury to a joint already much injured; perhaps he never doubts of the limb being luxated or fractured, till, after some months of the severest misery, the pain remits, the patient begins to walk, and recovers, at last, the use of his limb.

This mere bruise of the acetabulum is unquestionably the disease which Petit describes, where he says that he has often prevented it coming to any height by applying astringent solutions, and defensives made of alum, and whites of eggs, with spirits of wine. Rest is of chief service, but rest need hardly be recommended to one in such exquisite torture, whose pains are aggravated by the slightest motion.

Fifthly, When a scrophulous boy, under eighteen years of age, has laboured for long under a disease of this joint, where there is great lameness, little pain, a puffy swelling! if there come, at last, acute pain, hectic fever, symptoms of internal suppuration, and, at last, an abscess upon the hip or groin, you know that it is the constitutional disease, that it is seated in the bones, that it is analogous to the white swelling of the knee, or curvature of the spine; but unlike the disease of the knee joint, this of the hip cannot be amputated, and the boy must go through the fiery ordeal, and often dies from fever and irritation, great profusion of matter, and caries of the bones. If he survive, it is usually with a limb emaciated, crooked, hanging in air, and fixed by the ankylosis of the femur with the haunch bone. The chief danger of the disease is the boy feeling but too little pain to make himself or his parents sensible of the danger; if it be not chiefly in consequence of the pressure and motion that such disease goes on to the last stage of caries, yet certain it is, that under the pressure of the whole weight of the body such a disease cannot be cured; the only chance, then, of recovery, is from wine, generous diet, cold bathing, caustics, issues, and absolute rest.

DISCOURSE III.

OF FRACTURE OF THE THIGH BONE, AND OF THE
IRRESISTIBLE CONTRACTIONS OF THE MUSCLES,
AND SHORTENING OF THE LIMB.

*Nunquam os ea parte vinciendo glutinari et membrum in antiquum
statum reverti potest.*—PLATNER, § 1272.

IT is not without reason that I appropriate an entire discourse to this subject, the fracture of the thigh bone, or rather the contraction of the thigh. The subject is itself a study, a most interesting study. This is, of all fractures, the most difficult of cure ;—the machine is not yet invented by which a fractured thigh bone can be perfectly secured. The natural obliquity of the thigh bone, in relation to the pelvis, is such, that all its fractures, even in its middle part, are naturally oblique, and those thick and fleshy muscles which surround the thigh bone at its upper part, and give the thigh its conical form, contract with such irresistible force, that when the thigh bone is broken across at its neck, or at the root of the trochanters, no power of machinery (the resistance of the bone itself being wanting) can prevent the shortening of the limb.

thigh, they draw the knees close together, they co-operate in shortening and distorting the limb when the neck is fractured, or when the fracture is high in the shaft of the bone, especially if it be oblique, the contraction of these muscles turns out one end of the bone, and shortens the whole thigh; but when the fracture is below the chief insertions of the triceps, there is not, either in man or boy, any shortening of the limb, both because there are no muscles to distort it, and because the rectus cruris, and other muscles moving the leg, arise fleshy from the thigh bone, and by the hold they have upon the shaft of the bone all round, they rather tend to support and steady the fractured part. There is no distortion unless the fracture be uncommonly oblique, or unless the thigh be convulsed, the patient delirious or maniacal, or much of the bone be crushed to pieces, and destroyed.

But there is a kind of deformity peculiarly frequent in this very case, where there should be none. The fracture is near the leg, the leg is heavy, and the weight of the leg is allowed to turn the thigh bone vertically, the heel sinks, the toe turns out, the thigh bone (the lower end of it I mean) turns a little upon its axis, the slightest turning of the thigh bone gives a remarkable inclination of the foot, and the leg being permitted to lie thus a little turned round during the cure, the patient, when he rises, is found to walk as if he were splay-footed. In boys, I have seen this deformity lessen by degrees, till it was no longer perceived, the shape of the thigh bone, and the turns of its muscles, gradually accommodating themselves; but in men the deformity is permanent, they drag the

leg, and the foot goes along the ground side foremost, with an appearance of paralytic weakness.

We thus perceive, that the shortening of the limb proceeds from natural causes, which, perhaps, no power of machinery can ever counteract, none, at least, which the frame and texture of the limb itself can withstand, or which any patient can endure, although excited to endure to the utmost by the apprehension of lameness and deformity. This is a difficulty with which we are, perhaps, doomed for ever to struggle in vain ; for the power of resistance in any machine is applied at once, and cannot be increased or renewed but by intervals ! while the retraction of the fractured bone proceeds from the continual insensible nusus of the muscles, which steals upon the resistance ; a slight contraction, thus continually exerted, must overcome the resistance of the best regulated machines ; it is the wind and the sun contending for the man's cloak ; the less perceptible or violent this muscular contraction, it seems to be but the more irresistible.

Whatever has been contrived for preserving a fractured thigh from this contraction, it is my duty to explain. I have, indeed, but a poor opinion of those engines with which patients have been tortured, but I cannot withhold from you the knowledge of whatever has been invented by old or modern surgeons ; it is fit that you know how anxious all the most sensible men of our profession have been concerning this contraction of the thigh, what means they have proposed for the prevention of it, how the common machines are applied, and how they may be improved. But while it is my duty to explain those machines, it

are encumbered. The method which I am now going to describe was long the favourite manner of setting a fractured thigh. I shall describe this apparatus for distinction's sake, under the title of the long splint of Duverney, not because it was peculiar to him, since it was used by his contemporaries and by older surgeons, but because he used it of that uncommon length, that it was almost a stilt rather than a splint, extending not merely along the fractured limb, but along the whole body: it was a stiff splint made of thin board or of bend leather, it was laid along the body, reaching almost from the armpit to some distance beyond the extremity of the heel. The patient was in a manner laid upon the splint, which was fixed by a succession of circular bands surrounding the pelvis, leg, and thigh; one or more turns of a bandage went like the tail of a T bandage round the fork under the hip, to secure the hold upon the pelvis; while on the outside again, the top of the long splint was let into a bandage or folded towel, which was passed round the thorax. Thus was the splint fixed and prevented from slipping upwards, while the limb was kept extended by the circulars surrounding the knee and ankle; and though sometimes there was laid opposite to this a short splint upon the inside of the thigh, yet that seems to have proceeded from the unwillingness of surgeons to forsake old and approved methods all at once, for it was from the long splint only that they could expect to steady the thigh.

This is a method which should not be suddenly forgotten. The long splint has indeed the disadvantage of keeping the whole limb in an extended posture, but then it makes the whole limb one piece as

it were with the body, it prevents rolling of the thigh bone, secures in some degree the extended state of the limb, and enables the patient to be turned or moved on every necessary occasion without danger of displacing the fracture; it has been still the resource of the surgeon in his disappointments and difficulties; and Mr. Dessault among others, though he boasts much of his own peculiar method of fixing the body towards the head, and extending the limb towards the foot of the bed by lacs or bandages, seldom neglected to use, at the same time, the long splint of Duverney, to which, no doubt, was owing much of his success.

I am now to deliver the history, not of improvements, but of deviations from the simplicity of those machines of Duverney and Hildanus, of engines so complicated, that it is difficult to describe, impossible to use them; which would carry off the palm from the most curious engines of the inquisition; which indeed never did exist, except on paper, or in those chambers of the Royal Academy in France, where models of ships, and mills, and ploughs, and fracture-boxes, were tumbled together.

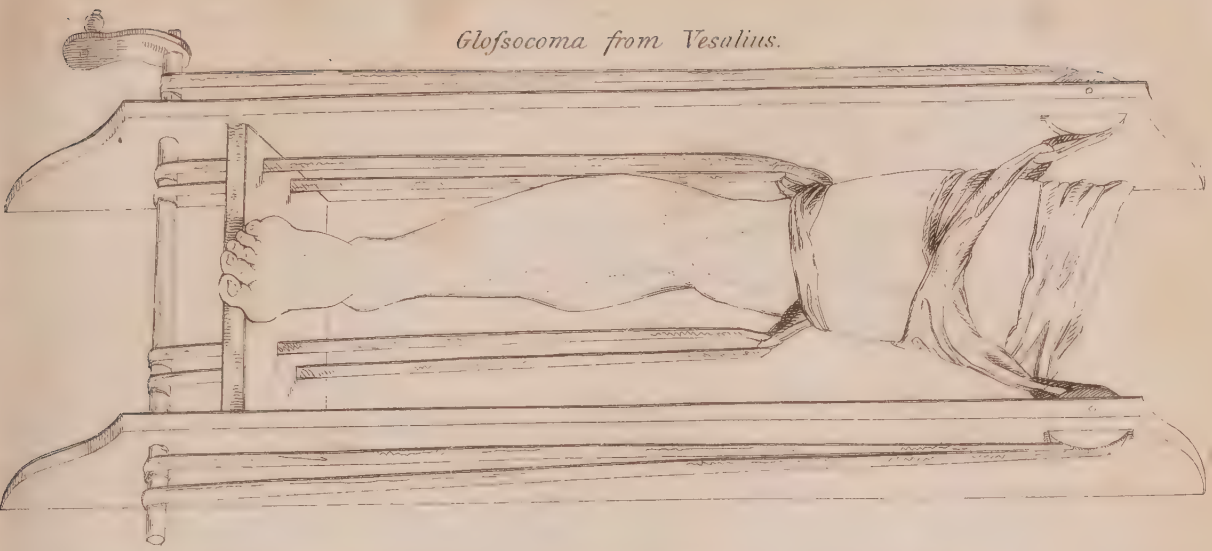
There have been, both in other countries and in England, surgeons delighting in the same trifling ingenuity, who, forsaking the rules of common practice, and the soundest principles of surgery, have been proud rather of demonstrating what machinery could do, than in reflecting wisely on what the living body could bear. Perhaps there never was a more tremendous exertion of this kind of talent than the machine of Mr. Belloq. which has been for half a century praised by all the surgeons of France, though used, I dare say, by none.

The machine of Mr. Belloq. member of the Academy of Surgery in France, consists of two parts, one which is steady, and has connected with it a sort of case in which the thigh is firmly enclosed; the other, which is moveable, runs in grooves, and is elongated by a vice or windlass; with this moveable part the leg, foot, and ancle, are connected; the thigh is close laced in the case as if in bodice, while the knee, the ancle and the foot, are bound very firm by braces or leather circulars, and when all the apparatus is fixed, the turning of the key or windlass extends the limb.

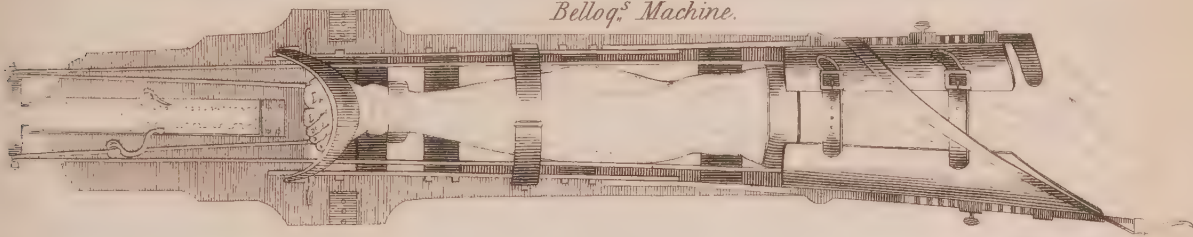
By this cruel and complicated engine the limb is kept in air; I do not mean that it is kept in that perpendicular posture in which it is necessarily drawn, but that the whole limb, instead of being regularly supported, as when lodged in a case, is insulated; nothing touches the limb but the several straps with which it is fastened; it does not even touch the iron rods by which it is kept extended as on a rack; the leg is fixed by circulars at the knee, at the calf of the leg, at the ancle, at the foot, i. e. over the tarsus or place where the buckle is usually placed.

But why should I explain thus in detail the faults of a machine which I have given a drawing of, or argue concerning the principles of it, since it has not even the merit of originality, which oftentimes reconciles us in some degree to things otherwise absurd? This is but a sorry improvement on the Glossocoma of the ancients, a machine which has been known time immemorial, which was used by Galen, and has been drawn in modern times by Vesalius, Scultetus, Heister, and others. In the drawings of surgical

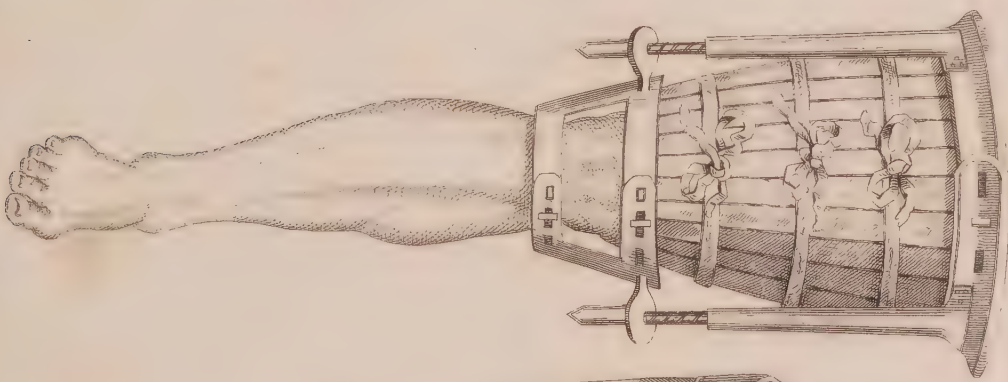
Glofsocoma from Vesalius.



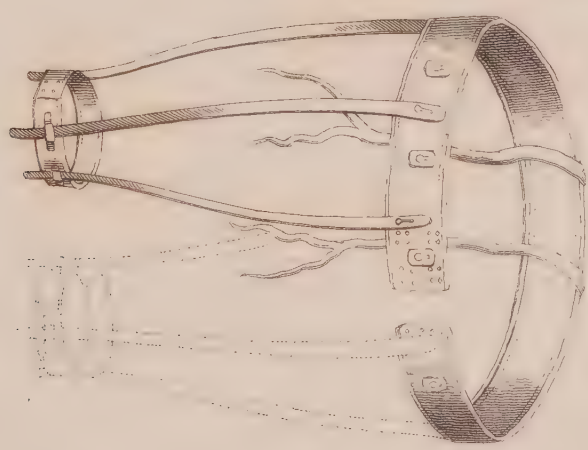
Bellog's Machine.



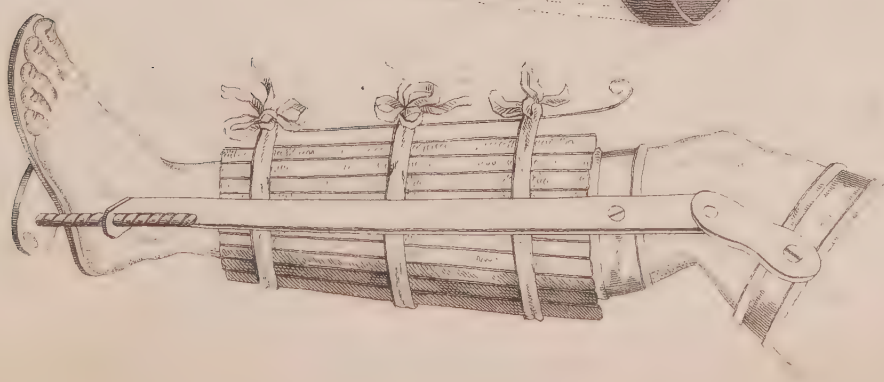
M. Benjamin Bell.



*Aitkens Improvement
of Gooch's Machine.*



*Gooch's
Leg Machine.*



inventions, we have often something seducingly simple and artful, but in this complicated machinery of Mr. Belloq. we perceive a cruelty and indifference to the sufferings of the patient, from which feeling and reason equally revolt ; it is plainly copied from the glossocomé which I have drawn along with it side by side, and the force which it can exert is of a kind which no patient could endure.

To the shame of England, so famed for good sense and sober judgment, our surgeons also have gone in search of new inventions. Nothing, I believe, is more apt to estrange medical men from simple and sensible methods than an unlucky theory ; no sooner was it observed that the spasms of the muscles were the sole cause of the retraction of the thigh, than the observation assumed all the importance of a theory, became the rule of all new inventions, surgeons talked of nothing but resisting the power of the muscles, and thought no method too harsh nor violent by which this great object could be accomplished. It was this doctrine of resisting the contraction of the muscles that gave rise to those torturing machines which were invented by Gooch, Aitkin, and Wathen.

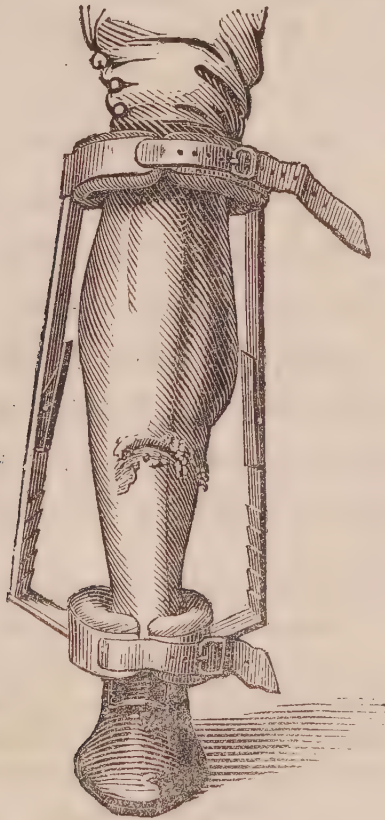
Surgeons having once begun to screw the limb into an extended state, seem to have been from that moment incapable of imagining any other kind of improvement except newer and more ingenious screws. The machine of Gooch, an experienced surgeon of Norwich, consists, like that of Belloq. of circulars for the hip, knee, and ankle ; one large and well padded circular surrounds the pelvis ; another embraces the thigh just above the knee joint, and a third embraces the leg just below the knee. Those

three circulars, well padded and covered with shamoy leather, are connected by iron rods, the rods are occasionally lengthened by turning the screws, and the circulars being buckled round the limb, you turn the screws in order to extend the limb. Gooch had his apology for inventing this machine; he was too old in practice not to have met with many real disappointments, and he openly acknowledges (whether out of real humility we know not, or to give importance to his discovery), that he had been often and cruelly disappointed in trying to cure a fractured thigh.

Next to Gooch came Dr. Aitkin, whose machine is the same, whose improvement was of the most trivial nature, consisting in some unimportant changes in the circulars and screws, and in adapting the machine to both thighs, when it chances (as often it does) that both thigh bones are fractured at once.

After him came Mr. Wathen, who, anxious to save patients from the real injuries and dangers of being carried awkwardly by unskilful attendants, invented a machine which he proposes should be applied immediately to a broken limb, and which from its preserving the limb while the patient is carried home he calls a Conductor. It is manifest that Wathen's conductor differs in no respect from the machines of Gooch and Dr. Aitken; it consists, like them, of well padded circulars which buckle round the knee and ankle; the circulars are connected with iron rods which steady the limb, and the notches and checks on those iron rods secure the extended posture of the limb, and being applied above the stocking and breeches when the leg is broken, it enables the attendants to carry the limb safely, and

serves as a conductor, and after the limb is properly bandaged and set, it may remain about the limb as a fracture machine. But, like the machines of Belloq, Gooch, and Aitkin, it grasps the limb only at distant points, as if with coarse unfeeling hands, it supports the broken bones at their extremities only, while the general limb is left unsupported and in air; like other machines, it has been praised out of all measure by its inventor, and neglected by every other surgeon; like the other complex machines, it has been forgotten and neglected in favour of the simple splint, or the still more unaffected



practice of laying out the limb upon a pillow. This, like other inventions of the kind, is explained to us by a drawing very nice and clean, but which, in place of being true, is a mere fiction; in place of reminding us of a fractured limb all swollen and disfigured, it

reminds us rather of Sir John Falstaff's sarcasm on the Prince of Wales's leg, "He wears his boot very smooth, like unto the sign of the leg."

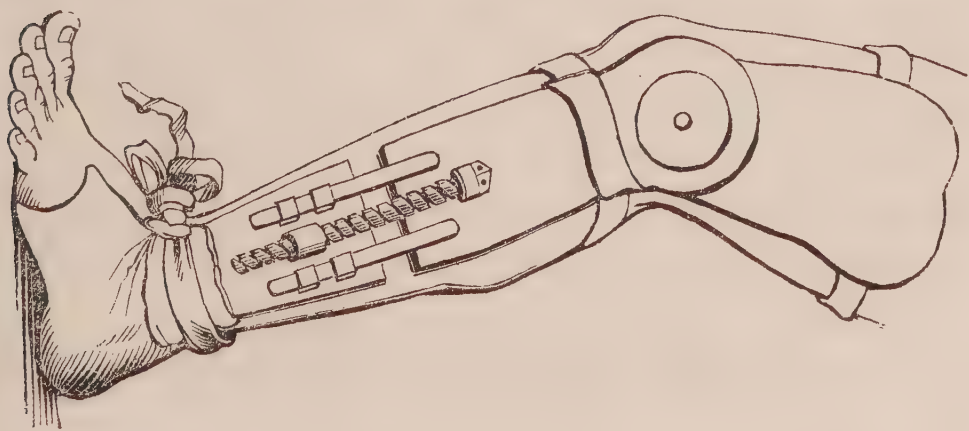
Nothing can be more surprising than the similarity of those machines, unless it be the anxiety of the several authors to be considered as the original inventors. These authors exclaim in bitter terms against their contemporary writers, each accusing the other of plagiarism, of stealing his invention; but their mutual accusations are, after all, but a verification of a good old proverb, which we need not repeat: Aitkin has in fact stolen from Gooch, Wathen from Aitkin, and all of them have stolen from Hildanus; no wonder, then, they found out each other's thefts*.

I now proceed to compare these machines with the invention of Hildanus. First, That these improvers have all had one common design, viz. of extending the fractured limb, and keeping it extended, is what I suppose none of them will choose to deny. Secondly, Hildanus seems, in his first machine which he invented in the case of the little girl, to have had no other purpose in view than to lodge

* The machine of Hildanus has an antique simplicity, while those of Aitkin and Gooch have a most scientific complication. From the slight variety we find among these machines, one would really believe that the variation of a few screws, knobs, nails and buckles, as fairly constituted a new machine, as a new preface constitutes a new book. Upon comparing the two books of Aitkin and Gooch, I do solemnly protest that I am not only at a loss to say which had stolen the machine, which is exhibited in this plate, from the other, but which has stolen the Treatise on Fractures from the other; were I examined on soul and conscience touching this point, I could no more distinguish the two books from one another, than I could distinguish two half crowns of the same coinage: the theory and the practice, the callus, ossification, ossific juices, profusion of callus, extension, counter-extension, coaptation, bandages, rollers, circulars, straps, buckles, and all! are of one pattern.

the thigh solidly within a firm case, to extend it occasionally with bands, and to secure it, when extended, by tying the circulars; but in the drawing of Hildanus, which I have given at the bottom of this page, it is plain that he also used machines in which the fractured limb being firmly embraced with circulars, was extended by the operation of screws. Thirdly, Though I confess it is so far honourable to those inventors that they have copied Hildanus, yet I cannot commend the spirit with which they have copied from him; they have joined two machines which he never joined; they have performed that extension by screws which he performed only by the hand, extending the limb gently from time to time; they have kept the limb extended by two iron rods, while he lodged it solidly and safely in a broad tin case; in his machine the resistance was universally diffused, in theirs it is limited to certain points of the limb. Since Hildanus at one time lodged the thigh in a simple case, and at another extended the leg by the operation of screws, I cannot but consider him as the original inventor, and these machines of Gooch, Aitken, and Wathen, as mere plagiarisms.

But of all arguments that of experience is the fairest, and these machines have now been tried by time, that severe justicer, who respects neither



authorities nor names. There is no reason why I should mention to you the experience which I an individual have had, since the total disuse of those machines expresses very unequivocally the opinion of the whole profession; but could I venture to represent to you, the contentions I once entered into with a stubborn and sturdy highlander in our hospital, who had fractured the neck of the thigh bone, I think it would cure you of all desire to repeat the trial. I have on several occasions tried those machines with that impartial zeal with which it becomes us to receive any suggestion, especially in a case of such acknowledged difficulty. I have re-enforced Mr. Gooch's and Aitkin's machines with additional buckles, belts, and screws, but I have only screwed my patient into a state of indescribable torture, in which neither he has had the courage nor I the cruelty to persevere.

Perhaps there cannot be a more awkward situation than that of the surgeon, who, trusting the unqualified encomiums of the authors of those inventions, has congregated his carpenters, smiths, saddlers, and bellows-makers, and set them to work! and after screwing his patient into a state of exquisite torture, is forced with shame and confusion to give up the point, and to lay out the limb smoothly upon a pillow to recover from the galling and bruising of his machines. It is then only that he begins to perceive the wide difference betwixt speculation and practice, betwixt a machine put about a sound limb, and a bruised and fractured one; it is then he becomes sensible how easily an untruth may be told in a drawing.

Next in order is the method used by Mr. Dessault

for extending the fractured thigh: I wish sincerely I could speak of his invention with respect. His theory is unworthy of his high character; his intentions, and indeed his very words, are anticipated, not merely by old surgeons, whose works he might have neglected to read, but by his immediate predecessors and contemporaries, Petit, Sabattier, and Duverney. He was in the custom of applying the long splint of Duverney with as much anxious preparation as if he had trusted to that alone, while his peculiar method, that on which he entirely depended, consists in fixing the patient to the head, and drawing down the heel towards the foot of the bed by lacs or bandages fixed round the ancle; a method neither original nor successful, not even consistent with the splint which he applied at the same time.

First, Mr. Dessault applies round the broken thigh bone (supposing it broken in the middle) one compress above the place of fracture, and one below it; over these compresses he applies an eighteen tailed bandage, and then taking two long pads or cushions, he lays them along each side of the thigh; thus far he complies with the rules of the veteran surgery, he binds up the fractured thigh with these compresses and cushions to fill the hollows of the splints. Next he applies a long splint about three inches broad, and reaching from the heel to the haunch, or beyond it, while he lays a shorter and smaller splint along the opposite or inner side of the thigh. The long splint is secured by being let in betwixt the folds of a table-napkin bound firmly round the pelvis, while both splints are made firm by bands of riband or tape tied round the whole.

Here there is nothing different from the methods

of Heister and others, but it seems a mere compliance with the customary practice; he troubles or rather tortures his patient with this complicated apparatus in mere compliment to the old surgeons, and then with all possible sang-froid concludes, "That yet nothing can effectually oppose the displacement of the thigh bone, except such an apparatus as shall prevent the trunk gravitating towards the thigh, and the leg, on the other hand, being retracted towards the trunk."

This is the peculiar theory of Dessault, and the additional apparatus which he next applies he boasts of as his own invention, and as the constant and successful practice of the Hotel Dieu for three years. The roller, the cushions, and the long splint of Duverney being applied, Dessault is next to prevent the gravitation of the body (or in plain terms the trunk sinking downwards in the bed), and the retraction of the leg. First, he puts a large folded cloth, napkin, girdle, or roller round the thorax, just under the arm-pits, to which are fixed those bands by which the patient is tied up to the head of the bed, and the body prevented from sliding down, from descending or gravitating towards the fractured limb. "Next (says Mr. Dessault) nothing is more easy than to prevent the thigh being retracted towards the pelvis;" and for this purpose, the ancle being encircled and defended with a long flat compress laid round the back of the leg and round the ancle, the middle of a common roller or bandage is to be applied round the heel, turned round above the ancles, crossed upon the fore part of the foot where the buckle lies, and tied over the sole of the foot; this roller carried to the foot of the bed, is fixed there.

Thus does Mr. Dessault accomplish that perpetual tension of the limb, which he decorates with the fine name, “Permanent extension;” but how he can regard this as peculiar to any period of surgery, as the exclusive practice of the Hotel Dieu, or as an invention of his own, I am at a loss to divine. The doctrine (since we must call it a doctrine) was announced by Mr. Petit in a very formal manner, and he was accustomed to fix the lac or ligature, which is designed for preventing retraction of the thigh, to the foot of the bed, while a large table-cloth fixed to the top of the bed, and passed round the groin, supported the patient, and prevented the trunk descending towards the fractured limb *. There is, indeed, nothing peculiar in the method of Dessault, except the precautions which I shall now mention: First, That in place of applying his bandage for extension round the lower part of the thigh, where the veins and arteries being subject to compression a swelling of the whole limb might ensue, Dessault applies his lac round the ancle, where, from there being less of the bulk of the extremity below the ligature, and the vessels being defended in some degree by the projection of the ancle bones, there is less danger of swelling. Yet this precaution of Dessault’s is far from being either new or effectual; for Hildanus, when instructing the young surgeon how to apply these very lacs, acknowledges, that though commonly applied round the knee, they may be better applied round the ancle: “Si quis tamen cingulum tibiæ

* “Le lacq du genou s’attache au pied du lit pour retentir la cuisse en bas, pendant que la nappe qui est attachée au chevet du lit retient tout le corps vers le haut, et *l’empêche de descendre*; ce qui maintient la cuisse dans sa longueur.”

circa talum adaptare voluerit non errabit." But should you incline to apply the lac round the ancle in place of the knee, you may with all propriety do so. And Mr. Sabattier (who wrote a paper on the subject before this publication of Dessault's) proves not only that this permanent extension has been at all times a very common practice *, but also that it is a very dangerous one. "The consequences (says Sabattier) of this method, are so distressing, that nothing can persuade me that it is not very dangerous; for the thigh and ancle are prodigiously swelled by the compression of the lacs, while the parts are excoriated by the filth of urine and the ordure with which the bands are continually soiled; while some have suffered much from continual fever and irritation, others have died in unspeakable torments." These are strong testimonies against this practice, they are plain representations of what Sabattier had seen; but they are not mentioned by Dessault, who with particular address, and, I am sorry to say it, disingenuity, passes over those testimonies, while he quotes Sabattier on every other point, and leaves to us the ungracious task of confronting Dessault's eulogiums on his permanent extension with these unquestionable facts.

* The writings of Sabattier prove that this permanent extension was not only a common practice with old surgeons, but that it was commonly used by his contemporaries, whence he is both entitled to represent the consequences of this kind of extension, and to describe the method, which he does in terms expressly similar to those in which Dessault explains the new practice of the Hotel Dieu. "On enferme ensuite la jambe et le pied dans des fanons, et l'on met audessus du genou et des malleoles, des lacqs assez longs pour pouvoir etre fixes a une planche placée au pied du lit. Le lien qui a servé a la contre extension est aussi fixe au chevet du lit. Par ce moyen on continue les extensions pendant une partie du traitement."

Secondly, Mr. Dessault, as he had removed the lower bands from the knee to the ankle joint, removes the upper band from the pelvis to the thorax. When Petit and other surgeons practised the same method, the patient was supported merely by a table-cloth or sheet passed round the groin; Dessault alleges that this would gall the patient, but Dessault's own bandage round the thorax produces not galling (which a man of fortitude could easily bear, which a man in these circumstances must bear), but oppression and insufferable distress, which no one can possibly bear. Of the difficulty of supporting the anxiety produced by this stricture round the thorax, Dessault's own cases give most unequivocal proof; his patients often were so oppressed with their bandage, and breathed so difficultly, that he was obliged to ungird them; and in one case the relief expressed by one of the patients is recorded by Dessault himself in very strong terms, though we may venture to suppose, that the patient would have used still stronger expressions. Dessault says, that when he exchanged the bandages and permanent extension for the long splint, the man was no sooner unharnessed of the girths with which he was bound to the head and foot of the bed, "than the pain of the thigh ceased, and he breathed more easily*;" but had the man been permitted to dictate his own page in the journal, he would, I dare say, have declared, "that he was in heaven the moment he was unbound." I perceive Mr. Dessault is unwilling to acquaint us all at once with the whole truth; for we find by circumstances

* A peine fut il débarrassé des liens qui le tenoient fixé a la tête et aux pieds du lit, qu'il ne ressentit plus aucune douleur à la cuisse et qu'il respira plus facilement.

mentioned on another occasion *, that the patient was so bound down that they were even unable to slip any thing under him to receive the natural discharges. His posture was as terrible as that contrived by the old lithotomists, who tied their patients not only by the hands and feet, as we do, but literally hilt to point; for besides the bandages which fasten the hands to the feet, they had another great bandage which went from the heels round the neck like a cobbler's strap, and tied the patient double.

To judge of the merits of these methods, imagine to yourselves the condition of a patient under Des-sault's discipline, first laid down on one side, and bound so to the long splint of Duverney, that the body and the limb were as one piece; next a great napkin put round the thorax with all the firmness of a bandage, straps going round the thorax, passing under the arm-pits, fixed to this circular, and the patient drawn up by these straps to the head of the bed. Next, imagine two lacs or long bandages, fixed one round the knee and the other round the ankle, one tightened when the other had caused excoriation; imagine the patient extended like a malefactor drawn by horses, bound so down to the bed that even a cloth or flat dish could not be slipped in under him, the bands assiduously tightened the moment they seemed to relax, and the thorax so bound and compressed that he could not breathe! think of all this apparatus of bandages, if you can, without holding in your breath as if trying whether such oppression could be endured. I think, for my share, I could

* An avoit gagné d'ailleurs la facilité de lui passer aisement un bassin pour aller à la selle ce qui ne s'executoit que tres difficilement pendant l'application du premier appareil.

as well undertake to live under water as in Dessault's, I might say in Damien's bed.

But why should we argue whether this be an original invention of Dessault's? for obviously this permanent extension would be the first and most natural desire of the surgeon, who would say to himself, "Now, could I but preserve the limb permanently extended, I must succeed in performing a cure!" nor, indeed, could any thing but the sad and painful experience we have had prove to us that a thing so desirable is impossible. Have not the surgeons of all ages used this permanent extension? Have we not machines and belts innumerable? Have we not the ancient Greek windlass and ship-block, the invention of Archimedes himself, dignified with the title of glossocoma? Have we not the jack-stone of Hildanus, which was hung to the heel, and the remora or post driven into the floor or table, which fixed the patient in his place, and prevented him slipping forward? Have we not the bed with surcingle and horse-girths, for tying the patient? Have we not the machine of Mr. Belloq, which, like the ancient glossocoma, could be laid in bed with the patient?

Of all the wonder-working machines, the chef-d'œuvre of surgical inventors, the glossocoma stands first in rank; it is the ornament of every old and of every modern book; its forms are innumerable; with it luxated spines, and hips, and jawbones, were reduced, and especially by it this permanent extension of the fractured thigh was accomplished. What, then, was the essential part of this machine which has assumed such various shapes, what was a glossocoma?

The glossocome was a pulley, or any thing which could stand instead of one ; it was usually composed of four strong pieces of wood nailed firmly together, enclosing an axis, wheels, pulleys, or any other coarse and strong machinery, and was arrived at its highest improvement when it was so connected with a fracture-box, that it could be laid in bed with the patient.

Of those engines there seem to have been three general forms. First, the Glossocoma Nymphodori ; Second, The Plinthium Nilei ; Third, The Trispastum Apellidis seu Archimedis was still the same engine, or, as they named it, Organon. Those three machines served but the purpose of blocks, capstans or windlass, and were of no use till fixed to the bed or ladder on which the patient was laid.

Such improvements as those coarse machines were capable of were not long delayed ; from being occasionally fixed to the table or ladder on which the patient was laid, they were soon permanently joined with the bed or table, so as to form very awful engines ! Of this kind was the bench of Hippocrates. The patient, laid on his back on the floor of this machine, was tied down to it bodily ; and whether the arm was to be reduced, or the fractured thigh, or the luxated spine, the lacs being fixed round the limb or round the body, were twisted by means of the axis, and the physician had it in his power to use what force he pleased, even to the tearing off the limbs. But words can give no idea of this engine of torture. The Scamnum Hippocrates is more like the drawing of a martyrdom, or some of the exhibitions in an Autode-fé, than of any surgical operation. Would you believe it, these great physicians esteemed surgery

so highly, as to think it degrading to that noble art to push in the luxated jawbone with the thumbs? The man who had his jaw luxated was laid in the bench of Hippocrates, and whether the jaw had started out on one side or on both sides, he was laid flat on his back, his arms tied down along his sides and belly, his legs and feet tied together like those of a mummy; the whole man was fixed solidly to the bench, and his head being held firmly up by one bandage, which went under the upper teeth, and an opposite lac being put into his mouth, something like a bridle round the lower jaw, the two axes or turning handles were set to work. We perceive, then, that there were as bold speculators, as scientific and ingenious surgeons in those days as in our own.

The machines had gone on continually improving, till at last the axis was permanently connected with a sort of trough, in which the broken limb was laid; and this was the beginning of that form of the glos-socoma which was used on all occasions, whether for fractures of the thigh or of the leg. This kind of machine was a modern invention in the days of Oribasius; it seems to have been much admired in the days of Paræus and Hildanus, but it is now antiquated, except in so far as it has been revived by Mr. Dessault, for this form of the machine was not only used for extending and reducing the leg, it was meant to maintain a permanent extension, it was laid in the bed with the patient. The old authors shock my credulity a little when they say, "*Commodissime admovetur*," "that it was a pleasant bedfellow;" for sure enough, when once applied, it was not taken off in haste, nor did they allow the patient to forget that it was there; after setting the fracture, it was

their constant care, by turning the axis, to correct the tension of the lacs, making them tighter and tighter from day to day. This completes the parallel betwixt the permanent extension of the ancients and that of Mr. Dessault, who says, "Our method has seldom failed us; but much of our success was owing to unceasing attention to tightening the bands." But if these bands were thus tightened from time to time, it is a fair logical conclusion to say, that they were slackened from time to time! that Mr. Dessault himself, with all his formidable bandaging, never did accomplish a permanent extension! This fine name "permanent" could never reconcile me to so unnatural and severe a method of extension, and in this one sentence Dessault himself proves that it is but a name.

But surgeons did at last fall upon a method which absolutely ensured the permanent extension; for being wearied with this perpetual turning of screws to tighten the bands round the ancle, they at last most happily thought of putting a pulley to the foot of the bed, and hanging a good jack-stone to the heel. We have drawings of the bed, the surcingle or horse-girth for the body, and the jack-stone of Hildanus for hanging to the heel; and according to my poor conception, the method of permanent extension was by this rendered so perfect, that Mr. Dessault could do nothing but disgrace himself by attempting any further improvement. Every step we proceed in this history weakens the plea of Dessault to originality, and, what is more important, demonstrates the folly of all such attempts. If this be not an anticipation of Dessault, if this girth do not "prevent the body gravitating towards the fractured limb, if

this jack-stone do not prevent the limb being retracted towards the body," there must be something in the theory and practice of Mr. Dessault passing all comprehension.

CONCLUSION.—I have laid before you this short history of various machines, not that you may imbibe from me those prejudices I may have contracted, but that you may judge for yourselves ; and I have delivered those histories in the very words of the inventors, because it is the only fair and impartial representation : " Would you hear it from our mouths or from our masters ?"

In reviewing the history of those machines, there is one phenomenon which often presents itself, that always after each disappointment in using the most curious machines, surgeons have returned to the most simple practice. This cannot be from indolence or disaffection to the high interests of their profession ; it cannot be from the want of a great variety of complicated machines that they return to the most simple ; it is, indeed, in the very moment of the highest expectation that we see their sudden turning back to the simple practice. The principle of this, I think, lies deeper than would be supposed at first sight, and is the very argument with which I would close this subject.

The resistance by which a limb is saved from being retracted is friction ; if this friction be all at one single point, it must be cruel ; but if diffused all over the limb, it may be endured. In those ingenious machines which I have just explained, there is much show and appearance of power, but it is all concentrated in one or two points ; the limb is grasped by

two or three circulars ; the force is of a kind which the soft parts cannot bear ; the retracting power (*viz.* the contraction of the muscles) is continually acting, while the soft parts below the grasp of the instrument are swelling more and more, and the parts immediately surrounded by the circulars are giving way ; the bands need to be frequently tightened, the side irons and screws need to be lengthened ; the whole machine is gradually slipping. The ill success of machinery which touches but at points, demonstrates to us that such kind of resistance cannot be made permanent like the contraction of the muscles, which always in the end prevails ! the first slackening of the machine is the beginning of that yielding which allows the incessant reaction of the muscles to prevail by slow degrees.

The contrast of the leg laid out smoothly upon a pillow is, with myself at least, very persuasive, there is no pain, no show of resistance, and yet there is much. Those authors pronounced the highest eulogium on the method of Mr. Pott, when they objected to it, “ That to lay the thigh out upon a pillow was to do no more than to commit the affair to Nature.”

When a limb is simply stretched out upon a well made pillow, first, It is not tortured, and so the muscles are not excited to contract. Secondly, When it is stretched upon the pillow, its own weight (swelled and lame, and unapt to action, unless when excited) fixes it, and every contraction which tends to shorten the limb is encountered by a proportioned degree of friction from every point of the outward surface of the limb. Thirdly, When the limb is merely extended upon its pillow, the resistance is great ; but when, beside being merely extended upon its pillow, it is

laid in a well framed case, stiff, adapted to the shape of the limb, bending gently, so as to allow of a relaxed posture, lined with woollen cloth, flannel or fustian, to increase the friction, and the bend of the ham secured by the bending form of the case, and each hollow padded up with little cushions of tow ! another splint laid on the opposite side of the thigh, the whole braced down gently with ribands, and then both the thigh and its case bound to the pillow by tapes ! the fracture is at once very steady and very easy. The resistance to contraction is hardly perceived, because it is so generally diffused ! it is sensible only in its effects, not by exciting pain ! there is more of gentle uniform resistance than could be derived from these torturing machines, which have seldom been screwed about a leg without being very soon thrown aside, and much greater than can be procured by that cruel extension which Dessault has decorated with the fine title *permanent*.

I have proved in a former discourse, that a thigh may be safely extended from time to time. In this present discourse it has been observed, that what has been called permanent extension, is actually an extension renewed from day to day. When the thigh is laid in the way now suggested, we have the fracture always under our eye ; we do not go through the cruel and formal operation of extending with lacs and pulleys, and numbers of men pulling upon a broken limb, which we are sensible we cannot retain in its extended position ; we stretch it gently, model it with our hands, lay it out smooth, stretch and replace it from time to time. We now find by experience, that where force is required it is useless, that it is only where force is not required that we succeed ;

we find, that after a gentle extension, the limbs of boys and girls, or of women, of weakly subjects, and of old people, lie pretty steady ; we find, that occasional extension corrects every occasional contraction ; we have no difficulty, except in the thigh of a strong and muscular man ; and we find, that after buckling the most powerful machines about the thigh of a strong and muscular man, we are invariably foiled, and obliged to desist. It is only a big unwieldy thigh that is much retracted, and we find by experience, that after some time, the strenuous contractions of such a thigh subside, its irritable resistance to our gentle extension ceases, it falls into a quiescent state, allowing itself to be soothed and gently drawn out and laid along upon its pillow ! I have often observed, that a big and muscular thigh at last settles down as it were, in its place, and takes a seat and posture, so that it is not easily discomposed by any accidental spasm, contraction, or unwary motion of the patient.

One who is deep read in theory only, while he seems to understand every thing, is conscious that he can do almost nothing ; he is acquainted indeed with the principles of science, but is disconcerted by the merest trifles, and is mainly uncertain how these principles should be applied. He is a philosopher handling the tools of a workman. He is like one who, when conducted through the chambers of a great manufactory, comprehends very well the force and effect of the various engines, and the powers which move them ; who understands the general design of the work, and the effects of each individual process ; who observes each particular workman as he passes by him employed in some little ingenious

operation, so simple to all appearance, that it might be performed by a child: but the philosopher has only to put his hand to the work, to be convinced that art and science should always go hand in hand; and that without dexterity of the lowest and most mechanical nature, the highest mental endowments are of no avail. But I will make no farther apology for instructing you in those little particulars of practice, which I hope you are desirous to learn.

We cannot but remember the melancholy story of the black eunuch belonging to one of the princes of Arabia, “who, having fractured his leg near the ankle joint, had it bound up very firmly by the prince’s body physician with compresses and rollers above the wound; but from that moment he neglected his patient entirely, except that he gave him strict injunctions not to undo the rollers. From the stricture of the bandage there came on a gangrene of the limb; and though I made no delay,” says Albucasis, “in undoing the bandages, and the eunuch had immediate relief from his pains, yet so much was the gangrene fixed in the limb, that it could not be stopped, and he perished.” This is one of a few melancholy cases that Albucasis sets up in the most conspicuous part of his preface, as beacons for the guidance of young surgeons; nor has there been from his time a single book on fractures in which there are not related dreadful examples of this kind: much as I have always remonstrated against rollers, I remember with horror, that a boy having a compound fracture of his arm (very desperate indeed, but so much the less a proper subject for bandage), I committed him to the care of God knows who, a man, however, in an official situation; he bandaged the fracture with

a roller, and at my morning visit I found the forearm bound more firmly than a mendicant's leg, the black skin appeared through the interstices of the roller, the hand swelled like a boxing-glove, perfectly black, and the cuticle separating; I need hardly say, that the arm fell into total gangrene.

Surgeons are gradually sliding into more simple and sensible methods; it is only through the individual operations of common sense, that a few strong-minded men have in the course of practice been enabled to forget the precepts of the school books, and have by their own natural good sense discovered the folly of bandages. System-writers still retain the old descriptions and terms of art, of which there is not one that does not imply an absurdity. Of these the most conspicuous are, extension, counter-extension, coaptation and diligation; what others there may be I hardly remember, but these are the most magnificent terms, the most favoured by the vile *pecus imitatorum*, who are characterized by Guy de Chauliac as regular birds of passage, to be expected at certain seasons, and "which follow each other like wild geese, all in a row*." These terms were descriptive of operations which were actually performed by the *glossocomas* of the ancients, and by the block and tackle of the modern surgeons.

Extension was the fixing of lacs and bandages upon the lower part of the fractured limb, to which were applied ropes and pulleys, by which the assistants pulled. Counter-extension was the resistance which other assistants made by table-cloths, girths and band-

* "De imo tamen miror, quia ita se sequuntur, sicut grues, unus non dixit nisi quod alter."

GUIDONIS de Cauliaco Chirurgia Capitulum Universale.

ages, put round the pelvis and upper part of the thigh. Coaptation was the thumbing and working the smaller fragments and the broken ends of the bone into nice contact with each other ; but diligation was a process which it would take hours to describe, as it took hours to perform ! of compresses applied round the broken ends of the bone, pads and cushions laid along the sides of the limb, splints above these compresses and cushions, with distinct rollers for each several stage of the operation. Such practices are, or soon will be, totally disused by all sensible men ; nor will the terms be allowed to remain as memorials of those absurd cruelties, or as stumbling-blocks to young students, who read about these, ay, and about more desperate operations, which never will be performed again*.

But I will describe the real operation in plain words, in which there is no occasion for any such terms as extension, counter-extension, diligation, rope, pulley, compress, or bandage ! That is indeed rampant surgery ! Were it possible for a limb to require such extension, it never could be maintained. When a limb, the leg, for example, is broken, you need no nice and critical diagnostic signs to distinguish the fracture by ; the broken limb yields under the weight of the body, the patient hears and feels

* I mean certain operations of cutting out tendons and nerves, when entangled betwixt the fractured ends of the bone, or cutting out irregular splinters of the bone in fractures of the ribs, sternum, &c. which I do not choose to say any more about ; only let my pupils beware, that, wherever in any book they read about such operations as disentangling tendons and nerves, by making an incision into the fractured limb, they are reading what never should have been written, and never can have been practised ; no operation of this kind ever has been performed, even by those who are so ignorant as to write such directions, and so imprudent as to address them to students and learners in surgery.

the snapping of the bone at first, and is sensible, when the limb is moved, of that grating of the broken ends of the bone against each other, which was in the old vocabulary termed *Crepitation*; and the surgeon, when he begins to handle the limb, is sensible of the same grating, he perceives by the bending of the limb that it is broken, and there is indeed so little difficulty in distinguishing a fracture, that I have never seen a patient who was not sensible of his condition, nor heard of a surgeon setting a sound limb, *except by design*. In setting this broken limb, there is no extension required but such as common sense would direct you to use, if you were not a surgeon. You lay the patient in bed, and lay the limb on a pillow, or if you design to use splints, you proceed as before described, page 31.

There is in this description, you perceive, no mention of those high-sounding terms which were so peculiarly descriptive of the grand surgery of the old masters; if we must retain them in our modern nomenclature, there should be associated with them no ideas of lacs, and pulleys, and assistants pulling at a fractured limb. Extension means, the surgeon gently drawing out the fractured member; counter-extension means no more than some friend or assistant holding it firm above; coaptation means only the smoothing of the limb and grasping the fractured parts in the hands, and pressing it so down upon its pillow or splint as to give it a sort of seat; while the diligation is a thing to be quite forgotten. There is much virtue in a word; many a lameness, and not a few gangrenes, may be imputed to this term diligation*.

* I here am careful to describe the common operation, and that only; there are certain cases afterwards to be mentioned, especially

Yet these directions, though plain, simple, and manifestly consistent with common sense and the best principles of pathology, will give you little confidence unless you be satisfied that they can be safely applied to each individual case, and that no other rules can be applied with good effect.

RULES FOR THE SETTING OF SIMPLE FRACTURES.

It is manifest that a fractured limb needs only to be laid even and moderately steady, to be perfectly reunited without our help ; but, if a person were drunk, delirious, or maniacal, it would need to be bandaged : for the same reason, if a fractured bone be in danger of being moved, by the unavoidable motions of the body, or by the natural functions, as respiration, it surely must be bandaged.

First, In fracture of the humerus or arm bone, the patient is not to be confined ; he is not to lose his health on account of this trivial accident ; and since he is to walk about, the motions of the body and swinging of the arm would necessarily discompose the bones, and absolutely prevent their reunion. The fracture of the arm bone then is to be set with two small flat splints of pasteboard, lined with flannel and rolled with a roller gently, but not carelessly applied, because the common splints merely tied with tapes would slip off, and because the arm hangs naturally away from the body, so that it is easily rolled.

N. B. When the fracture is near the lower end of

of compound fracture with protrusion of the bone, where a more powerful extension is necessary ; but still neither pulleys nor ligatures are used, only, the surgeon sometimes twists a hand towel round the ancle to give him a steadier hold.

the shoulder bone, near the condyles, or in what is improperly called the neck, viz. near the head of the bone, it is apt to be more oblique, and then firmer splints, a steadier bandage, and more careful posture of the arm is necessary ; and, when it happens that the shaft of the shoulder bone is separated from its head, the axilla should be filled with a compress to keep the bone out and in its right direction.

And let me observe, that when you have to treat a fracture near a joint, as in this instance of the fracture near the elbow joint, you must use precautions against ankylosis. For this purpose, at the end of a month, you must take off the bandaging and splints, and, grasping the elbow with one hand, you must, with the other, bend the joint ; and must so, from time to time, move the joint, supporting the broken extremities of the bone at the same time. It is very necessary to do this, when there is an oblique fracture into the elbow joint.

Second, When the fore arm is fractured, although one bone only be broken, it is easily distinguished, because the slightest turning of the hand produces rotation of the radius, and consequent crepitation, the radius being fractured ; whereas, when the ulna alone is fractured, the change of shape is almost as great as if both bones were broken. When one bone is broken, the arm manifestly cannot be shortened ; and even when both bones are broken, the general surface, formed by the two bones and their interosseous membrane, is so broad, that they are fairly opposed to each other, and soon reunite. The fracture of the fore arm requires two flat splints, which are to be laid one on the inside, the other on the outside of the arm ; and in place of rolling the fore arm with a

roller, I usually tie the splints with three or four broad tapes or ribands, each about a foot in length, not connected with the splints, but laid upon the table under the lower splint, when the arm is about to be laid upon it.

N. B. In the fore arm I have remarked two things, first, That the hand must not be turned in any degree, i. e. it must neither be in what anatomists call a state of pronation, nor a state of supination, but the thumb even with the line of the Radius, and the little finger with that of the Ulna; and to preserve it in that position, the splint that lies on the inside of the arm must be long enough to reach to the palm of the hand, so as to keep the wrist steady, and prevent rolling of the radius; and this splint, where it is lodged in the palm of the hand, must be a little padded and a little bent, so as to let the fingers bend easily over it.

Fracture of the Radius. The radius is very frequently broken, and it requires attention; take care that you do not raise the hand too much, or you will make the broken ends approach the ulna; where, if they unite, the patient will lose the rotation of the wrist. Take care to support the hand against pronation, or the bones will unite, so as very greatly to impede the turning motions of the wrist.

Observe, also, that the representation I have given of the adhesion and massing of parts about a fractured bone, is so far true, that the callus is formed, not by the particular ends of each individual bone, but by the whole mass of bone, inflamed periosteum, and cellular substance; whence it often happens, especially in compound fractures, where the mass of parts engaged in the process is great, or in gunshot fractures,

where the arm, from the tediousness of the sore, lies very long extended upon its splint, that the ends of the bones are united in one mass of callus, by which the motion of the radius is hindered, and of course the turning motion of the hand is lost. This produces a more awkward and distressing kind of lameness than you would easily imagine, the patient cannot carry any thing to his mouth without turning the arm at the shoulder, the effect is the same precisely with that of an ankylosis of the elbow joint. I saw several examples of this at Yarmouth, in the Dutch hospital, where men, shot through the fore arm, had been permitted to remain in their cradles all the time of the cure, their arms lying all the while flat and unmoved, till at last they became immoveable.

Third, In fracture of the clavicle, or collar-bone, the weight of the arm pulls down the scapula, for in fact, the clavicle is the only connexion the scapula has with the trunk; the scapula itself only glides upon the ribs, without being connected with them; large muscles lie betwixt the lower flat surface of the scapula and the thorax. The clavicle then supports the scapula and shoulder, and when it is broken, the shoulder falls forward, the shoulders seem narrower, the pain is greater than in other fractures, because the fracture is always oblique, and the weight of the arm and shoulder makes the one end of the broken bone fall under or shoot past the other. The accident is easily distinguished, as the bone can be felt in its whole length; perhaps there never was a patient sober enough to know any thing of his own situation, who was not conscious of the nature of the accident that had befallen him when the collar-bone was broken.

This particular fracture is both reduced and retained, by first pulling both shoulders strongly backwards, and then turning a firm linen roller round the shoulders, crossing upon the back, so as to leave the place of the breast where the fracture is, exposed and open; for this no more requires splints nor compress than any other fractures; it is only in consequence of the weight of the arm, that the fractured clavicle requires firm bandaging, and this reminds you, that you must be careful to support the elbow.

N. B. This particular fracture is rarely accompanied with wound, nor is there any difficulty in reducing or retaining the clavicle in its right place; but sometimes it may be useful to fill the axilla with a large compress, in order to support the shoulder and to keep it off from the thorax, so as to extend (if we may use such an expression) the broken clavicle to its full length. When the arm is big and heavy, when the patient has to complete his journey in a carriage, &c., it is proper to add to the figure of eight bandage round the shoulders, another bandage supporting the fore arm and confining it close to the body. This second bandage is indeed necessary in every case, to prevent the swinging of the arm and the inavoidable rolling of the collar-bone.

In respect of the fracture of the acromion process of the scapula, it may be sufficient just to remark, that it also is known by a falling forwards of the shoulder, and the place of the fracture is easily distinguished, as the bone is superficial. This fracture requires chiefly that the shoulder should be pushed upwards, by which the head of the shoulder bone, pressed upwards against the fractured process of the scapula, raises it to its right place. In this fracture,

the shoulder must be bound firm, and the fore arm particularly well supported.

Fourth, In fracture of the sternum, the broken bone is moved, not by the motion of the trunk or body, but by respiration ; at every motion of the thorax, the patient is sensible of the grating or crepitation of the bones, the surgeon feels it with his hand, and hears it by approaching his ear to the breast. The motion of the broken sternum soon inflames the mediastinum under it, and by degrees, the inflammation extends along the pleura and whole of the thorax. There comes on a frequent cough, and during every paroxysm of coughing, the crashing of the fractured sternum is dreadful. This points to the necessity of bleeding ; and following that, such opiates and mucilages as will allay the irritation.

This fracture admits neither compress nor splints, and yet it must be kept perfectly steady ; to do this, nothing is required but a simple swathe or bandage round the chest, but it must be made so firm as to prevent the respiration being performed by the motion of the thorax ; the motions of the thorax must be entirely suppressed by the bandage, and respiration performed by the diaphragm alone.

In this fracture, the motions of the thorax being incessant, the reunion of the fracture without bandage is impossible ; if you fail to apply the bandage, the motion of the bones will raise the inflammation to that height, that the patient will be suffocated by the general affection of the lungs, or by the effusion of matter round the broken bone ; and the least misfortune that can happen is tedious suppurations under and around the broken parts of the sternum, and caries of the bone itself, so that it becomes necessary

sometimes to apply the trepan. The bandage which we have directed, though drawn very firm, is far from oppressive, the patient feels it to be rather a relief; before the bandage is applied, the grating of the bones, the inflammation, high breathing, and terrible cough, are increasing every moment; but no sooner is the bandage drawn firm than the crepitation ceases, the pain is relieved, the cough and high breathing begin to abate, and by plentiful bleedings and opiates all comes right again, and the patient is saved.

Fifth, Fractures of the ribs are like those of the limbs, simple or compound, with or without injury of the surrounding flesh; and when there is injury of the adjacent parts, it is by the ribs being driven inwards, so as to wound the lungs without any outward wound, such as make the inflammation dangerous.

If the fracture be simple, of one or more ribs, it is distinguished, and hardly distinguished, by a slight crepitation, the broken ribs being wrought backwards and forwards under the fingers, by the patient being sensible of the grating of the broken bones, and by the sharpness of the pain; and we have to take care that a mere bruise of the muscles, lying on the ribs, be not mistaken for a fractured rib, which I have seen more than once. There is little crepitation, because the ribs are so connected with each other by the intercostal ligaments and muscles, that they cannot be displaced; each rib serves as a splint to preserve the direction of the adjoining ribs. There is no occasion for setting the broken rib for any compress, nor for any particular bandage; but to prevent motion, the heavings of the thorax are to be sup-

pressed by applying a broad roller, to swathe the breast, which, the firmer it is applied, gives the more perfect relief. This is all that is usually done.

When the rib has punctured the lungs, the air is effused, an emphysematous tumor is formed, crackling like a bladder half full of air. I would be inclined to say, there is no possibility of mistaking the nature of the accident, had I not known it prove fatal by ignorance ; it may in general be disregarded, for inflammation round the broken bone soon closes the opening in the thorax ; inflammation in the wounded part of the lungs prevents the farther effusion of air, the air already effused is absorbed, and the tumor disappears. But, if the effusion of air continue, the whole body will be inflated ; the air passing along in the cellular substance will inflate the scalp and eyes, and extend downwards to the thighs and private parts, till, by its accumulation about the throat, it almost suffocates the patient. Small scarifications, with the point of a bleeding lancet, are required to discharge the air ; they may be made occasionally in various parts ; they heal immediately. After the cellular substance is emptied of the air, the point where the broken rib is should be pressed with a firm compress, to assist the adhesion of the lacerated parts surrounding the fracture.

Sixth, In fractures of the spine, there is nothing that belongs to the surgeon's department, the case is purely medical ; the spinal marrow is affected by the compression of the fractured bones, or injured by the concussion, just as the brain is affected by a blow on the head ; but it is a kind of injury much less accessible to the surgeon's hand. The spinal marrow is plainly compressed, the patient loses instantly the

power of his lower extremities, which are cold, and without feeling, the bladder and rectum are paralytic; the surgeon needs to order glysters daily, and to introduce the catheter. The parts on which the patient lies ulcerate first, and then, in spite of all possible care, fall into gangrene. Such are the symptoms, and such frequently the manner of our patient's death; and, notwithstanding the bloody operations described in books, of making incisions, finding the fractured or luxated bone, and drawing it out by the spines or splinters, there is nothing practicable, and those very ignorant directions given upon the highest authorities are dangerous to none but boys. The cutting into the fractured vertebra is a dream.

In all fractures of the leg, simple as well as compound, you merely lay the limb out upon its pillow or splint; nothing but convulsions, delirium, or mania, can endanger the fracture, or require bandaging. In laying a fractured leg, where but one is broken, you need be at no pains about the posture; if the leg lie easy, and the patient complain of no pain, all must be right; but, when both bones are broken, you must be at pains to trace the sharp line of the tibia with your finger, for that regulates the posture of the leg. This you cannot do at first, because the general swelling hides the bone, but you have no fear of altering the posture of the limb, and you know that the subsiding of the swelling marks the proper period for ascertaining the posture of the limb.

In fracture of the leg, and especially in compound fracture, you must be careful to preserve the right posture, for the limb is exceedingly apt to change its form from day to day, according to the place that the

patient takes in his bed, and the posture of the limb with regard to that of the body. Two points you will especially attend to, first, The heel slipping over the end or side of the pillow, or, making by its prominence more impression upon the bed or pillow, falls downwards; and when the bones are reunited, it is found that there is a slight deviation of the tibia from the straight line; the bone appears a little prominent on the inside of the leg, while the foot is a little turned outwards, in a lame, or at least a weakly posture; yet this degree of obliquity, though it causes a slight awkwardness, never causes a great deformity. Secondly, The strong muscles lying all on the back part of the leg, the fractured part is more apt to be bent in the opposite direction, so that the bones unite, with an angle at the shin. This causes a grievous deformity, and worse than that, produces a shortening of the limb, and a halt in the gait almost as remarkable as that which arises from fractures of the neck of the thigh bone, and the point or angle where the tibia projects is apt to become a sore, for it is very easily fretted and ulcerated. This is especially to be guarded against, and is particularly apt to happen in compound fracture, where the limb being laid in a great case, is plastered and poulticed, so that the surgeon hardly allows himself to see how the bones lie, and has given such a formidable appearance to the disordered limb, that he is afraid to look at his own work, to clean the sore, or to move the leg. Two directions then may be useful; first, Always to pad up the heel and foot properly, so as not to allow the heel to sink, or the foot to fall to one side; secondly, To be careful always to prevent the leg taking an arched form with an angle at the middle of the tibia; it is impossible

to keep the foot too far forwards, or, in other words, an angle in which the middle of the tibia was depressed was never known to happen. If the leg shall be turned from lying on the outside, and laid out on the heel, you must take care to manage the foot-board so as to preserve a just direction of the foot.

Eighth, But why should a man lie with a broken leg when he can sit or even move? Indeed, I know of no reason; it is often proper that we should set our patient's leg, so as to enable him to sit, were it no more than that he might receive his friends, play cards with them in an evening, and linger through his confinement with as little tedium as may be; it is sometimes necessary that a man should be wheeled in a great chair into his office or counting-room to do business; it is sometimes absolutely necessary that he should be diverted and moved, for some men have, from so slight a matter as a fractured leg, fallen into incurable hypochondriacism.

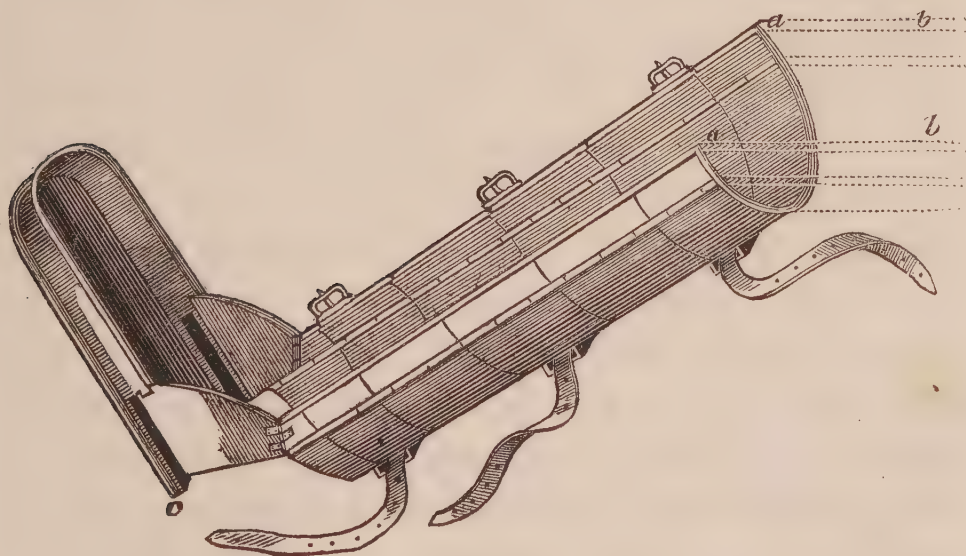
To accomplish this, the limb must be more regularly set, and then placed in a box. I do not think rollers or compresses necessary, and yet they may be used; for since they are not used with the design of shaping and regulating the callus, but merely of steadying the limb, keeping it soft, and filling up the hollows betwixt the limb and its box, there can be no danger of their being drawn too firm, yet the rolling with rollers, &c. moves the limb too much.

The process I follow is this: The limb having lain on its pillow for eight or ten days, and the swelling being gone off, I lay an eighteen-tailed bandage, made of fine linen, upon the pillow, and lap the tails of the bandage gently round the limb, and the linen being old and worn, makes the limb feel cool, soft, and pleasant;

next over that, to increase the thickness, I lap the tails of an eighteen-tailed bandage, made of fine soft flannel, which, were it applied next the skin, might cause itching and heat. The limb being now softly padded, as it were, with those bandages, is to be laid on a long and firm pasteboard splint, another splint is to be laid above it, in each splint a hole is to be cut for the respective ancles to which they are applied, and the two splints, extending each of them beyond the knee and ancle, are to be bound very firmly with the several tapes over the foot, ancle, calf of the leg, under the knee, and above the knee ; and it is worth observing, that in tying tapes in this manner at regular distances over two stiff splints, though they may be bound so firm as to give pain and uneasiness, they can never (like a roller turned firmly round the naked limb) produce gangrene.

When this is done, the limb is firm enough to be lifted and moved freely in bed ; and if, for example, it were the limb of a soldier, who were to be conveyed away along with a retreating army, or sent to a general hospital ; or of a sailor, who, lying in his hammock, which is a very narrow and inconvenient bed, perhaps during the agitation of a storm, were in danger of having his fracture deranged ; or a person who having broken his limb on a journey, needed to be carried home ; you might make the whole steady enough to resist all accidents, by just applying two long flat sticks or boards, one to each side of the limb, above the pasteboard splints, binding them firmly like a second set of stronger splints, long enough to pass the heel and the knee. Of course, such splints must be applied in the extended position of the limb.

But for a person, especially in genteel circumstances, who merely wishes to sit up and be amused, a neat small box should be prepared, with a long and firm board, a little hollowed or cushioned, to lay the leg upon, a foot-board to rest the foot upon, moving by a hinge, and occasionally raised or depressed, to change the posture of the foot and relieve the ancle; the sides of the box should be made with hinges, so as to open and close, and somewhat concave, or composed of thin wood pasted on leather, and then split with a knife, so as to bend round the limb and enclose it firmly. With this box, neatly applied round the limb above the splints, the patient can be in no danger from any ordinary degree of freedom. In order to give some specific idea of the manner of fashioning this box, and yet to leave some degree of latitude to the ingenuity of the surgeon, I give a sketch of one very old; it is the machine of Guille-



meau, the pupil and favourite apprentice of Paræus. Such a machine, with a hinge at the knee (a), a board to go upwards a little way under the thigh (b), and

with wheels under the heel or angle of it (c), so as to make it run smoothly along the floor, may be easily contrived. In the military service, or at sea, the carpenters will, with a few nails and leather, put boards together, so as to make a very safe and commodious case. For a person of rank, such a box may be nicely wrought by a joiner while the first inflammation and swelling of the limb are subsiding; and perhaps one or two such machines, neatly made of wainscot, should be kept in every infirmary.

Ninth, But in fracture of the thigh, there is no possibility of rising, nor indeed of having any relief, but by that slight change of posture which can be accomplished by moving the body, while the thigh itself is kept as steady as possible upon its pillow. Whatever degree of confusion you may have felt upon reading a history of the various machines, will be easily removed by a few simple directions.

First, When the neck of the thigh bone is broken near its trochanter, you would not leave the cure entirely to Nature, you would not willingly believe that you can do absolutely nothing for your patient or friend. When you extend the limb, and find that you have so far replaced the broken bone, that you begin to feel the crepitation, you cannot but wish to retain it in that place, and you lay large and firm compresses upon the trochanter, the rising of which marks the shortening of the limb, and the fixing of which would prevent that shortening. These compresses should be pressed very firm by a spica bandage rolled round the hip, as it is in page 195, Vol. I. round the shoulder. The long splint of Duverney must next be prepared of sufficient length to

reach some way up the side, made of firm deal board, declining gradually in size, in proportion as the member naturally diminishes in size, covered well with flannel, that the patient may feel no hardness. There must be put round the pelvis a very firm bandage like the topband of a pair of buckskin breeches; and into a slit in this bandage must be fitted the top of the splint. The resistance which is to elongate the limb is to be accomplished by the pressure of the top of the splint against this circular, and therefore the circular must be prevented from being pushed upwards by a strap going round under the pelvis, like that of T bandage; or why should we not actually take the topband of a pair of buckskin breeches, keeping also a part of the thigh of the breeches to make the pressure more general, with a pocket something like the fob or side-pocket inverted, to slip the top of the splint into, as an ensign lodges the colour-staff in his side pocket? I need not relate to you how, after the chief resistance is established, the limb may be extended and secured by laques round the knee and ankle; as to the permanent extension, if you will attempt it, it must be easier with the assistance of this splint; after fixing your laques or bandages round the ankle, you may bring one of them round the lower end or point of the splint, and extend it occasionally without any ill-looking apparatus, any apparent cruelty, or real violence.

Secondly, When the fracture, in place of being in the neck, is below, the trochanters in the shaft of the bone, where fewer muscles are implanted, the retraction is less powerful, but still there is retraction, and the shortening of the limb must be resisted by the

long splint of Duverney alone ; it is not a torturing machine, does not grasp the limb at particular points, but lodges the whole limb, and gives friction and resistance at every point.

Thirdly, When the thigh bone is fractured in the middle, there is no reason, even in the most muscular man, to fear retraction, and the thigh may, with all possible propriety and safety, be laid smoothly out upon a pillow, being careful of the posture of the body, that it be not higher than the thigh, so as to gravitate downwards upon it ; the thigh should be laid on one side, should be laid a little out from the body, and a little higher (indeed the body naturally sinks into the bed) ; and the surgeon should also be careful of the posture of the heel and foot, for the leg is apt, by its weight and wrong inclination, to turn the thigh upon its axis.

Fourthly, In fracture of the very lowest part of the thigh bone, in the part adjoining to the condyles or lower head of the bone, the fracture is apt to be very oblique ; and sometimes it happens, that the bone is fractured so very obliquely, that the effect is the same as if one of the condyles only were broken away. In this oblique fracture there is, indeed, no forcible retraction of the bone, but a continual tendency to obliquity. Very often I have seen such a fracture so ill cured, that there has been a shortening and weakness in consequence of the in-kneed posture of the limb, which was both very distressing, and a very great deformity. Then, although there is no occasion in this fracture for any powerful machine, there is a necessity for the perpetual resistance of a very strong splint. The leg turns outwards, the splint of firm fir board, &c. is therefore to be applied

(with proper compresses to prevent pain) upon the inside of the knee joint, and bound very firm with circulars above and below the knee. You cannot bend the leg too much inwards ; it always inclines to turn out.

[But all the difficulties mentioned above may be overcome by laying the fractured thigh bone and leg upon two boards, nailed together at an obtuse angle ; both the hip and the knee joint will be bent, while the thigh may lie straight and firm on this inclined plane, surrounded with the usual simple apparatus of splints.]

N. B.—In fracture of the thigh bone, we foresee a very uneasy confinement of six weeks to the most irksome postures, and the ease and comfort of our patient are principally to be studied. He should be laid on a hair mattress, which is cool and firm, rather than on a bed in which he is apt to sink down ; and it will be of infinite advantage to him to have a fine flat and thin hair mattress cut into four or six pieces, and the cut parts sewed again, and covered with pieces of sheet ; then first laying boards in place of the canvas across the frame of the bed, then laying an entire mattress for the bottom of the bed, and then laying the several pieces of the cut mattress according to your pleasure, you can raise or depress any part of the body to any degree, and alter your patient's posture with the least possible motion. If any other pillows be required, they should be the firm and flat hair cushions like those of a couch, and indeed the best bed is a couch, which friends and attendants can go round about in all directions, which can be wheeled to the window, or towards the fire, without discomposing the fracture, and which should

be placed in some public room, where the patient will have as little as possible of the feelings of a sick-bed. He must have occasionally anodynes to abate the irritation of his confinement and distressing posture, and laxatives of castor oil, cream of tartar, lenitive electuary, sulphur, or whatever suits his constitution, to prevent the constipation which proceeds from opiates and confinement.

Tenth, In compound luxation of the tibia and fibula, in that where the bones are broken, the joint burst up, the heads of the bones turned out through the wound, the astragalus and heads of the tibia or of the fibula almost separated, there is such destruction and laceration of parts, that we are doubtful whether to attempt preserving the foot; we can do little more than lay the limb on the sound side, and keep the foot as nearly as possible in its natural and proper direction. I have sometimes seen the ankle joint wonderfully distorted from being fractured and dislocated, even without that laceration of the skin which constitutes the case a compound fracture; and by drawing upon the foot very gradually, but powerfully, and working and modelling the disordered joint in the hand, I have restored it to its right shape, have set it with a firm splint well covered with flannel, &c. and bound pretty firm with a figure of 8 roller round the foot and ankle.

In this fracture still the tendency of the foot is to turn outwards, and you have to lay your splint along the inner side of the ankle joint, making a small window, or opening, in your splint to receive the projection of the inner ankle. By the resistance of this splint you draw the foot, which is inclined to turn outwards in a splay-foot posture, inwards into

a natural one. It is the process of the fibula that guards the angle on the outside, and keeps the foot right; and it is the fracture of the fibula, and the yielding of the outer angle, that makes the foot fall off towards that side.

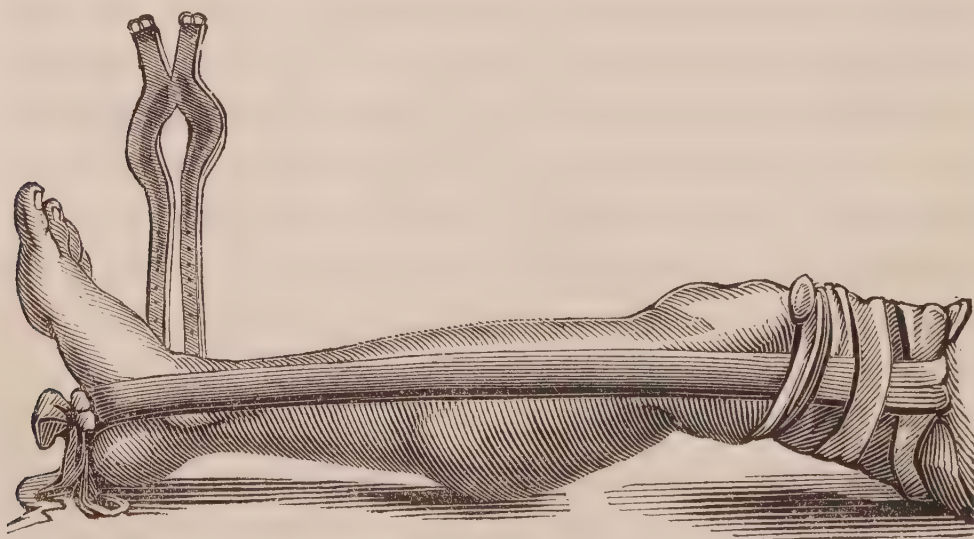
I mention this luxation here, because it is the only luxation where the head of the bone, being replaced, does not remain; it is the only luxation that needs to be bandaged as a fracture.

Eleventh, In fracture of the patella the chief difficulty is to preserve the bones in perfect contact with each other, insomuch that Dr. Hunter, unable to account for the difficulty of accomplishing a perfect cure, imagined that the failing of the usual process, in this particular instance, could be owing to nothing else than some part of the membranes surrounding the joint falling in betwixt the two bones, so as to prevent them coming into proper contact.

In this particular fracture the leg must be kept extended to the utmost, and the trunk raised in a sitting posture; the upper piece of the fractured patella, which is retracted to a great distance above the knee, must be smoothed and thumbed downwards, and put in as close contact as possible with the lower fragments. To put it in close contact is the difficulty; it seems to be in close contact at the time of your operation, and you are only convinced that the pieces have not been in contact when the cure should be complete; for when the swelling has subsided, when the patient begins to walk, a hollow is seen betwixt the two ends of the bone, and a ligament of some length is felt uniting them. The patient losing the pulley-like projection of the patella or rotula (and the extensor muscle being shortened),

is never able to stand on one leg, never able to bear up the body on that limb, never able to mount a stair without carrying that leg before, and is never out of danger of forgetting himself, trusting the weight of the body upon that limb, falling backwards, and so breaking the other patella, or snapping the same one a second time, as I have seen happen very often.

To preserve the bones in absolute contact, and prevent this imperfection in the cure, is almost impossible. The swelling, before you are called, is so great, that in many cases bandage cannot be applied for six or eight days. When the swelling is gone, the pieces of the bone cannot be made to approach each other, nor can the bandage, from the remains of the general puffy swelling, be applied close to the bones. The bandaging has been attempted in various ways. The common bandage is a belt of leather, split like the common leather retractors, with a small opening in the middle of the slit for receiving the patella; each of the sides or semicircles of this opening is padded up with leather, so as to make a pretty firm compress of a circular form; and when the



bandage is buckled round the knee, and drawn firm, the two sides of the slit are of course drawn so close together, as to press the two pieces of the patella betwixt them.

If you are in the country, where no such bandage is to be procured, you may, with fully as good effect, bind the broken patella in the following manner:—First, if you have to carry your patients any length of way, I do not know of a better bandage than a hand towel, or something nearly as thick, put round the knee like a figure of 8; nor indeed can any thing, perhaps, be preferable as a permanent bandage. Having carried your patient home, and laid him in bed, you first take a thick, flat, and very long-shaped compress, which is to serve as both compress and bandage, and which, of course, must be a yard and a half in length; you lay the middle of this compress over the upper or ascending part of the patella, and you press it down upon the patella with both hands; you then bring it round the thigh above the knee joint, then cross it behind under the ham, then cross it again upon the fore part of the knee, and then secure it. The second part of your operation is performed thus:—You take a very long and firm linen roller in your hand, you proceed to thumb down the patella into the closest contact possible with the lowest piece, perhaps you put another compress over the upper broken piece, and your roller being a two-headed one, you take one head of the roller in each hand, you press the middle of it firmly down upon the compress, then your assistant presses the thumbs of both hands upon the upper piece of the patella, with the design of pushing it very close down, and when he has pushed it as low as possible, you make

your first turn of the roller under and behind the ham, to secure what he has gained, and you continue at your own discretion turning your double-headed roller in figure of 8 round the joint as long as you think you are gaining any thing in respect either of closeness or security.

But I have often been inclined to think, that the thicker our compresses and bandages are, the more are they inclined to slip, as, for example, in reducing a luxation, where the lacs and bandages put about the leg or arm are so clumsy that they cannot but slip. Perhaps, then, it would be as well, if, instead of this clumsy compress, we were to take a smaller compress of about three fingers broad, and not quite the length of a finger, and connecting it with a short roller like a tourniquet compress, apply it over the upper or retracting part of the patella, and secure its place by pinning the roller, just as you do that of the tourniquet compress. Next, it would be well to take a broad two-headed roller, lay the middle of it over the compress, and make one or two turns in figure of 8, depressing the patella, and ascertaining its posture still further, but without putting any clumsy thickness of bandage round the limb. Then (the part being in some degree steadied) I would take two bandages of an ell long, and lay them along, one along the inside, the other along the outside of the limb; the one end of each band is laid up along the thigh, and the other down along the leg; I would then begin the application of that roller by which I meant to secure the upper part of the bone, I would take a thin, but very firm linen roller, single-headed, and several yards long; I would turn it round and round the lower part of the thigh, just above the

joint, immediately above the bone, so as to take a firm hold of the bone above the condyles, embracing the longitudinal bandage at the same time, and this roller should not be very broad, less than a hands-breadth. This circular roller being thus applied, and having a firmer hold of the patella, and being so tight, that upon pulling it down, the patella will be pulled down, you turn down the upper end of the longitudinal roller, or that which lies up along the thigh; and the longitudinal roller lying thus under the circular one, embraced by each turn of it, when you pull upon the longitudinal bands, you draw down the circular bandage, and thus depress the upper broken piece of the patella, till it almost meets and touches the lower piece; and as there are two longitudinal bandages under the circular (one on each side), you may carry the two longitudinal bandages under the sole of the foot, and tie them together. To give a more complete pull upon the patella, you might, if you pleased, lay under the turns of the roller a third longitudinal bandage exactly in the middle, which being tied like a stirrup under the ball of the great toe, would perfectly preserve the extended posture of the limb*.

Before applying these rollers, they should be all soaked and wetted (best in spirits), to make them stick closer to the flesh, and if (having applied them) you are perfectly satisfied with their operation, you may easily convert them into a firm case, by taking a glue-pot and soaking them with glue, so that each turn of your roller would stick to another, and the whole to the flesh, the knee being thus enclosed in a

* This manner of bandaging is explained in the figure in p. 186.

very perfect case. Both during the cure and for some time after the patient begins to walk about, I find it convenient and safe to stiffen the joint, by laying a strong splint behind the ham, lest the patient should make a false step, and the knee yield before the ligament joining the bones were become strong.

I have been particular in these directions, because I think it right to take the assistance of bandages for the broken patella, but posture is of infinitely greater importance; and take especial care that you relax the rectus muscle, by raising the body of the patient into the sitting posture.

Twelfth, In fracture of the olecranon (which is another exception to the general rule of keeping a fractured limb gently and pleasantly bent), you must keep the arm almost completely extended, for the triceps muscle pulls up the olecranon to an incredible degree, it mounts absolutely half way up the arm, and although you thumb it down again, yet if you keep the fore arm in any degree bent, the interstice betwixt the end of the ulna and its broken process will be filled up with bone, and the fore arm be so far ankylosed, that the patient will never be able to extend it, for this filling up of the interstice will be just equivalent to the lengthening of the ulna.

In setting this fracture, you thumb down the retracted olecranon, which is broken away from the end of the ulna, and you extend the fore arm so as to make the end of the ulna meet its broken process, you cover the broken process with a compress, and fix it with a double-headed roller, turned in form of figure of 8 (as in bleeding), making occasionally turns purely circular round the broken part, and you make all sure by laying a stiff splint in the

bend of the arm, and fixing it with a second roller in order to prevent the arm being thoughtlessly bended ; indeed nothing, in such cases, should be trusted to the discretion of the patient.

In this fracture there is abundance of callus ; there is no danger of that imperfect and ligamentous union which takes place in the broken patella, nor is there any danger of that profusion of callus, running like molten lead, into the cavity of the elbow joint, which was supposed to happen, and to occasion anchylosis. When this fracture has been neglected or ill set, the fore arm kept at right angles with the arm, and the person lamed, perhaps, in his right arm, it has been proposed to make incision to cut out the intermediate callus, with the design of setting the bones properly with the arm extended, an operation which is surely not impracticable. But it is possible to do almost any thing with a joint, by means of motion, champing, and therefore such an operation should not be thought of.

Thirteenth, The rupture of the Tendo-Achillis, or great back tendon of the leg, more justly ranks with fractures than with lacerations ; for while it was considered as a laceration of a soft part, it was actually the practice of surgeons to sew the ends of the tendon together with great embowelling needles ; but now being ranked with fractures of the bones, it is set like a broken bone, like the fracture of the patella, for example, and the surgeon has no care but merely to smooth down the muscle, to prevent the retraction of the tendon, to preserve the ruptured parts as nearly as possible in contact with each other.

The Tendo-Achillis is broken as the patella is, not by a blow or fall, but by a sudden and violent exer-

tion of its own muscles, in consequence of making a false step, the patient being instinctively incited to make an exertion too sudden and violent for the tendon to withstand it; an exertion which sometimes, in place of tearing the tendon, breaks the heel bone. When the tendon is broken, the patient, from its insensibility, feels no pain, he feels as if he had been struck a smart blow with a stick; it commonly happens, in dancing, or in making a false step, as in slipping, though not unfrequently it happens when walking apparently securely on even ground; the patient instantly falls down lame, the shortening of the bellies of the gastrocnemii muscles, the retraction of the tendon, and the interstice between the two ends of it are perceptible, and the patient himself is conscious he has broken the tendon.

For setting this ruptured tendon various machines have been invented, and especially various shoes with straps and buckles behind to draw up the heel, while the upper part of the tendon, on the other hand, is pressed downwards. According to my experience, this extension of the toe and drawing up of the heel are unnecessary; the foot may be safely left in its natural posture; it is chiefly important to prevent the slightest contraction of the gastrocnemii muscles; for this purpose, the calf of the leg should be smoothed downwards with the hands, the whole of the calf of the leg from the ham downwards must be rolled with a firm roller, proceeding from above, but the bandage should not pass the biggest part of the calf, nor at all approach the ruptured part, nor even the inflammation and swelling which surrounds it.

The chief danger in rolling the leg in rupture of the Tendo-Achillis consists in approaching the part

actually fractured. I was once called to a gentleman whose whole leg, from ham to heel, was firmly bandaged with a roller, the turns of which made deep impressions on the swelled ancle; and at the point where the tendon was actually ruptured, the turns of the roller (so firmly was it drawn) had sunk down very deep indeed betwixt the ends of the tendon; they were thus separated to a great distance from each other, there was no possibility of their uniting, and had they been left so, the old gentleman must have continued perfectly lame. It was on the fourth day after the accident that I was called, and undid this bandage, yet the cure was in the end tolerably perfect. The muscle should be well rubbed and smoothed down, and neatly rolled, the ancle and cellular substance surrounding the ruptured part should be left perfectly free, the foot should be steadied, but kept quite on the level, the toe neither pointed downwards nor upwards, but the foot kept at right angles with the leg. Mr. Robbard, surgeon, I believe, at Ipswich, was so bold and so honest as to make the experiment first on his own person, of just tying down the gastrocnemii firmly, but still continuing to walk about all the while the tendon was reuniting. This I dare no more approve of than the firm bandaging of the ruptured parts.

The tendon is generally a little knotty, especially when first united; sometimes it adheres so to the surrounding parts, as to make the joint stiff; and always the tendon is a little lengthened, and the muscles of the calf somewhat contracted, so that the calf of the leg seems to have shrunk upwards towards the ham.

CONCLUSION.

In this section, consisting altogether of rules, which should be perfectly minute, I fear there must be many omissions, which I shall hardly be able to compensate for in the following general observations.

First, It is uncomfortable for the young surgeon not to know at what period he may venture to undo the apparatus in any particular fracture; for this reason, though there can be no specific nor absolute rule, yet surgeons have been at pains to mark the period in which they suppose each individual fracture to be healed. Without warranting the propriety of these rules, allow me to mention, that authors say the smaller bones, as the clavicle, the ribs, the fibula, are cureable in twenty days; the bones of the cubitus or fore arm, the radius or ulna, are cureable in thirty days; the fractures of the shoulder bone, or thigh bone, require fifty days to reunite; though, to be perfectly reunited and strong, the fractured thigh bone requires seventy days. But rules so specific as these, mentioning the very day on which a fracture may be supposed to be cured, cannot be useful without being understood. Nor is it from the slow formation of callus that the cure is delayed in fractures of the great bones; the process is not slow in proportion to the greater mass of bone that is to be formed! perhaps a callus will form as rapidly round the bone of an ox as round that of a boy, and be as speedily completed in fracture of the thigh bone as in fracture of the radius, for every part has vessels proportioned to the mass of callus that is to be formed;

but the cure is slow in proportion to the size of the bone, from the larger bone having to support a greater weight, or rather the mass of callus is slow in acquiring firmness proportioned to its size, or to the weight it has to bear. It is for this reason that we are cautious of trusting the weight of the body too early on a broken limb; in fracture of the humerus, as the arm hangs and does not necessarily carry any weight, the patient may leave off his splints in six weeks; it is proper and usual to undo the bandages and splints, and to let the patient move into any variety of posture, but still to keep his bed for a week; but in fracture of the thigh bone, which has to bear the whole weight of the body, we dare not expose the unconfirmed callus under such pressure till fully three months have elapsed.

Allow me also to observe, that on particular occasions, particular precautions must be taken; that while a man is in his sound health and reason, no bandage nor splint is required in fractures of the lower extremity; but that when a man is maniacal or delirious, besides the ordinary precautions of splints, the limb, after being set, must be laid betwixt two pillows, tied to them, and the pillows, in their turn, fastened to the bed; that when a man has to be carried far with a fractured limb, besides being regularly bandaged with splints, there should be laid along the sides of the limb, above the splints, long and firm pieces of wood, bandaged like the splints, and extending beyond the heel to prevent accidents. And finally, that in the sea service, and in the army, when either an army is to retreat, or an hospital to be moved, or when a storm is expected at sea, the surgeon should be as carefully advertised of the

approaching storm, or of the present movement of the army, as any higher officer, for he has many precautions to take for the safety and comfort of his men.

The surgeon, when he wishes to make any part or bandage particularly secure, has it in his power to convert his rollers into a firm case, either by soaking the bandages in whites of eggs, which soon hardens in a very firm varnish, or with the whites of eggs may be mixed a little flour and sugar to make it into a paste, or he may apply any common varnish over his bandages, as white spirit varnish, but that is slow of fixing, and is very thin, or he may strew a little powdered rosin on his bandages before they are applied, and then by soaking the bandages with spirits of wine, the rosin is dissolved, and the whole adheres to the limb with very singular firmness; or, finally, the bandages may be soaked with fine and well made glue, which makes a very firm case, and is very far from being offensive.

These methods are all of them more cleanly, less cumbersome, and indeed I think more effectual than the old Arabian method of bedding a fractured limb in stucco or Paris plaster.

Lastly, I would observe, that though in a fracture of the leg or thigh bone, or of the patella, splints are quite unnecessary during the cure, yet when the patient rises from bed, rests the weight of the body on the fractured bone, and begins to be exposed to accidents, light but firm splints should be laid alongside of the limb; while he wears those splints he is in a manner under your control, will walk with restraint, and be careful of using dangerous freedoms with the limb, and thus he may be saved from a second con-

finement more terrible than the first, as it is incurred by precipitation and rashness.

RULES FOR COMPOUND FRACTURE.

Perhaps there is no sight more shocking, or that more particularly impresses us with the idea of irremediable destruction, than what we call a compound fracture ; a mangled limb, with the bone protruding some inches, the wound through which it protrudes lacerated and ragged, the surrounding skin black and livid with ecchymosis or extravasated blood ; the whole limb swelled enormously, even in the course of a single hour ; and the patient, with his mouth parched, his eyes heavy, and his head confused ; he is, indeed, often delirious with fear and suffering. But the surgeon dilates the wound a little with his bistoury, reduces the bone, composes the limb, and brings the integuments close, so that what seemed a terrible laceration appears to be but a wound of very moderate length. The limb which was before so distorted, that the foot lay altogether on one side, lies now right and even ; the blood, which was streaming from the limb or caked about it, is now cleaned away, and a piece of clean lint laid upon the wound, and though such a case is never without danger, the assistants and friends are sensible that a situation apparently very desperate, and certainly fatal without help, is soon converted, by the care of the surgeon, into a state of hope and expectation.

You will easily perceive, that in an injury varying so much in its circumstances, there must be an infinite number of nice and curious operations to perform, of stretching the limb, dilating the wound,

reducing the protruded bone, and taking away the splinters, stopping the hæmorrhagy, and laying the lips of the wound in contact ; and you will naturally imagine, that where there are such complicated injuries, such laceration of the soft parts to heal, and so much bone to be reproduced, the suppurations will be often very profuse, and the cure long delayed ; and that during such tedious cure, you must have much to do for your patient, to moderate the suppurations, and to preserve his health. It shall be my business to represent, in regular order, the state of the patient, and the various duties of the surgeon, from the first moment of this dismal accident.

What strikes you upon first seeing your patient is, along with the horrible disorder of the limb, his febrile state and disorder of mind. For as the limb swells in a few hours, the fever named Symptomatic fever rises ; you observe the tongue parched, the lips black and dry, the breathing oppressed and anxious, the eye heavy and blood-shot, the pulse is thumping, and the head is confused ; the patient is not unfrequently delirious, and the fever and delirium often continue for eight or ten days. Nor is this disorder a mere consequence of the wound, great as it is, for you will observe by the wild countenance of the patient, that there is as much disorder of the mind as of the body ; perhaps, he has, upon the cry of fire, awoke from sleep, and thrown himself in the utmost terror from a window, his limbs are terribly shattered, and when he recovers the use of his senses, he finds himself carried by persons unknown to him through the confusion of a midnight mob ; what recollections of friends left in circumstances of danger must then rush upon his mind, it is needless to men-

tion. This general shock then to the bodily frame and to the senses is succeeded by coldness, shivering, trembling, and confusion of mind; the delirium sometimes begins from the very first moment of the accident. This shivering marks the commencement of the fever; this previous state of coldness requires that the patient should be laid in a warm bed, that warm flannels should be applied, that he should have a little warm wine or other cordial, that he should have a dose of laudanum. If the patient is to be bled, it is only when the pulse, at first trembling, becomes full and thumping, when the face flushes, and the eyes become inflamed; in short, during the first trembling and disorder the patient must be comforted by cordials, it is only after some hours that he can be safely bled, though the vulgar after every accident are in haste to bleed.

OF CARRYING THE PATIENT.

Your first care is to have your patient carried with as little injury as possible, and if you have but a little dexterity and recollection, he can be carried with none; for unless it be a soldier who has his thigh bone broken in the field, and who is carried off by his companions in their arms, or a sailor whose leg is broken by shot, splinters, or the recoil of guns, and must be carried down a succession of gangways by the boatswain's crew, every person having a fractured limb may be carried without injury. Now, I will venture to say, that however excellent the machines which have been, or may be invented, as by La Faye in the *Memoirs of Surgery*, or by Mr. Wathen, they will never be at hand, and though

they were, it is fit the surgeon should know how to use the most ordinary apparatus. When I now proceed to separate the several little operations of the surgeons, it is not because I consider them as distinct operations, but that I expect to describe them more distinctly, by considering them as successive steps of one great operation; and though I describe the manner of conveying the patient before that of setting the limb, yet I think there is no apology for not performing every operation that relates to fracture upon the spot, since nothing is required but pasteboard, clean linen, a little lint, a knife to make any dilatation of the wound that may be necessary, and the fingers alone are best for hooking out and disengaging the loose bones.

The moment you arrive at the place where your patient lies, you must proceed to extend the foot, while your assistants hold the limb, and by pulling firmly, steadily, and, remember, very strongly (for in this case a good deal of extension is required), you get the bone to go back within the integuments, and though perhaps you do not get the bone and the edges of the wound arranged exactly to your mind, you get the foot restored to a right direction with regard to the leg, the bone tolerably covered by the integuments, the patient relieved in some degree from the pain of this protrusion, and the whole member put in such a posture that you can lay it on a splint as a safeguard. There are two forms in which the compound fracture usually presents itself; first, when the patient having leaped or fallen from a height, the bone is merely broken, and protruded perhaps to the length of some inches, then the foot being extended and the bone reduced, you,

after laying scraped lint upon the wound (which presently cakes with the blood), lay it upon a stiff splint made of fir board properly covered and padded with cloths, to which the limb being fixed by broad circulars of any common riband gently tied, and with proper folded compresses put for softness under each of those circulars, the whole becomes pretty firm, and can be carried with safety ; but if the fracture have been produced by the crushing of machinery, or by a loaded waggon passing over the limb, the bones are so crushed and destroyed, and the whole limb so reduced to a mash, that you should rather, after applying small cushions of lint to the lacerated wounds, lodge the disordered limb in a case, and for this purpose the surgeon should be provided either with large tin cases lined with cloth or leather, or should have by him some of those conductors of Wathen, which are made of bend leather exceedingly hard glazed and varnished, in the shape of a large boot, cut perpendicularly through the middle, and large enough to lodge a swelled and disordered limb.

The limb being laid on a firm splint, or in such a case as is here described, the patient is then to be laid on a mattress, which may be placed upon a window-board, a door, a ladder, &c. for these are commonly used by the country people on such occasions. It has been the fate of several men of our profession to have their limbs thus fractured. Pott is not particular in mentioning the manner in which he had himself conveyed to town when his leg was fractured ; but Paræus relates the misfortune which happened to himself with all the interest natural to the occasion, and with the unscrupulous and tedious

minuteness of the old style. He was called, with two other physicians, to visit a patient not far from Paris, but they had to cross the Seine, and Paree wanting his horse to go into the boat, struck it on the crupper, when immediately the animal lashed out behind, and broke both the bones of his leg, when, partly from the agony, partly to avoid a second blow, he tumbled forwards into the boat, his leg bent under him, the bones protruded, and in this condition, and with a degree of pain which you almost feel when you read his description, was carried to the further side of the river to have his limb set. The description of his sufferings when he was carried from the boat is animated. “This pain was more dreadful,” says Paree, “than that which I suffered in the boat; one carried me, another sustained the leg, a third held the foot, one carried high, another carried low, one made his step to the right side, another to the left, but at last they brought me to my bed, and laid me down there to take my breath, and wipe off the sweat that distilled from every pore of my body.” These are the miseries of being carried in men’s arms with a broken limb not fixed upon a splint. Indeed I need hardly have quoted Paræus to explain what any man of sensibility can easily imagine.

Perhaps you have at first only turned down the stocking, or cut the breeches, but the patient being now brought to his own home, you proceed to perform your operations more regularly. You have had your patient conveyed along with all possible tenderness, but you now proceed to operations which require a degree of harshness, and even of apparent cruelty.

First, You prepare the bed, by lifting the mattress and clothes, and in place of the laced canvas bottom, you lay boards across the bed-frame, which makes the bed hard, and keeps it perfectly level and true during the cure. You next, in place of the feather-bed, lay only a mattress above the boards; for a feather-bed permitting the patient to sink down, the body gravitates towards the fractured leg, so as often to make the bones overshoot each other with a dangerous shortening of the limb. You next cut another mattress into four pieces, and round each piece you sew a piece of sheet; these are laid over the first mattress, and shifted under the patient from time to time. You then lay a pillow for receiving the limb; and having laid your patient on this bed or couch, you proceed to cut off the breeches, stockings, &c.

OF REDUCING THE PROTRUDED BONE.

The first and most important point of practice I have to teach you is, how to reduce the bone; and to instruct you, I must be careful to represent the several possible conditions of the parts. Let us first suppose then, that the patient has thrown himself from a window on the cry of fire, or let us suppose that he had a simple fracture, had become delirious, had been carelessly watched, and had risen from his bed, and stalked furiously about the room with the fractured bone driven through the flesh, and stamping upon the ground; then the tibia protrudes through a very narrow opening, the foot is turned entirely over to one side, the bone is as if strangled by the flesh; it is difficult to extend the limb so as to get the bone to go back again through the skin,

but it is possible, and you try it in the following manner: You lay the whole limb quite flat, you make two strong assistants, with both their hands, grasp the leg very firmly below the knee, you then grasp the foot firmly over the tarsus and behind the heel with both your hands, and begin to pull gently, steadily, and very powerfully, turning the foot a little from side to side; you also twist a hand-towel round the ancle, and take the assistance of it to give you a firmer hold on the foot, and to make you pull more steadily and equally. But if the bone will not go back, you must give the foot to another surgeon or assistant, and clasp your own hands round the broken part, and with your thumbs, without much reserve or affectation of delicacy, force in the bone, which, though it needs this force to reduce it, yet lies easy when it is reduced.

The ancients not only used pulleys and hand-ropes for this purpose, which we strictly forbid (we rather dilate the wound), but Hippocrates used a wedge, which he introduced betwixt the bones to poise them into their places; and we even find La Motte using the levator of a case of trepan instruments (I suppose) for reducing the tibia.

Finding it impossible to reduce the bone, on account of the narrowness of the wound and its swelling and strangulation, you proceed to dilate the wound, you try to push in your fore finger or your little finger to conduct the bistoury, or, if necessary, you push in the bistoury, which makes way for itself; it is the straight probe-pointed bistoury you use. You have only one danger to avoid, that is, the cutting of the tibial artery, and to avoid that, you keep to the inner side of the leg, and opposite to the highest

ridge of the tibia (not to the outside of the tibia, for the artery lies in the middle betwixt the tibia and fibula); you run your bistoury forward, and carry it pretty deep, till your finger which follows behind the bistoury passes in easily, and till you feel the stricture quite relieved. But if you find the bone splintered with points and spiculæ, which (if it were reduced) would run into the flesh, instead of reducing the bone in this dangerous condition, you bite off the sharper points with the cutting forceps of an amputation case, and having smoothed the bone, you may then, after dilating the wound, reduce it safely.

If you find at the same time the bone strangled by the narrowness of the wound, and pointed at its extremity, so that it would be dangerous to return it among the soft parts; if you are sensible that the bone is broken so obliquely, that though reduced, it would not keep its place, but allow the other bone to shoot over it, and at the same time so sharp pointed that the spiculæ would run into the flesh, you have then to make your election betwixt the two operations of dilating the wound and of cutting the bone; and as you prefer cutting the bone, you proceed not merely to smooth it with the cutting forceps of the amputation case, but to amputate it in the following manner: Your assistant takes a flat iron spathula to defend the soft parts with from the teeth of the saw, lays it flat under the bone betwixt it and the flesh, he holds it steady by one or two fingers on each side of the bone, and presses or draws it up edgeways betwixt the bone and the flesh, and the spathula being thus fixed, you proceed to saw the bone as close as possible to the wound with the small spring-

saw, commonly put into the amputation case for the purpose (though never used) of sawing the finger bones.

Thus the bone, being cut into a plain and even surface, may be safely reduced, and keeps its place well.

Let us next suppose that the patient has not thrown himself from a window, nor fallen from a height, that the bone does not protrude, but that a loaded waggon has passed over the limb, and that the bones have been so crushed, that through one great wound a large piece of the tibia has been squeezed out, that the separated piece of the tibia projects, and is easily pulled away; that upon introducing the finger through this lacerated wound, you feel the bones all shattered, the splinters loose and moveable, the tibia destroyed to a great extent of three or four inches, according to the broadness of the wheel, and that upon insinuating your finger, you hardly distinguish the lacerated flesh from the bruised bone. You perceive that this is a more complicated injury, and will be surprised that parts thus macerated preserve their living principle, or survive even a few days without gangrene; but that the parts which are entirely destroyed, that the bones which are squeezed through the skin, should be regenerated by this mass of lacerated flesh and bruised bones, is almost incredible! it is incredible, by how small a hold of the soft parts a piece of bone will sustain itself alive, preserve its circulation, adhere with the surrounding parts, and regain its connexion with the unhurt part of the bone! In the most alarming circumstances you never despair.

You proceed then to disengage and pull away any

pieces of the bone that are squeezed out ; you insinuate your finger into the wound, and hook out any pieces of bone that you encounter with the finger, and which seem loose enough to be hooked away ; and using the finger as a directory, you venture to introduce upon it the common small dressing forceps to lay hold on any loose point of bone which you cannot compass with the finger so as to hook it out. This is an operation where good sense and moderation are required ; it is not to be learned by experience, for it is an operation which few have an opportunity of repeating often ; it will be best performed by those who have studied the general principles of the profession, who have been accustomed to reason and to occupy their minds with the design and intention of each operation, rather than with particular methods. In dressing a limb thus shattered, you take away the pieces which are entirely loose, because they are plainly destroyed, and must produce suppuration ; you are at pains to get away the sharper splinters, though not so entirely detached, because they excite spasms by their immediate irritation, and cause abscess after abscess till they are discharged ; you use the finger more than forceps ; you would spare no present pain in order to put the parts in a good condition for lying easy, and recovering their healthy state ; and although you would take away whatever splinters might cause abscess, you would not work too long with your finger, nor pick with your forceps too curiously, lest you should cause more suppuration by your own imprudence. But you perceive I might give you a volume of directions, and still be obliged to conclude at last, that I must leave much to your discretion and good sense.

OF SECURING THE BLEEDING ARTERIES.

Let us next suppose that the crushing of the bones is accompanied with a bursting or laceration of the arteries; the blood always streams from the limb, and cakes about the wound soon after; often small arteries bleed smartly at first, but shrink before you can attend to them, and close entirely by putting a little bit of lint to the wound; but when the tibial artery, as often happens, is wounded, it bleeds so as to require attention. Sometimes you have occasion for the needle, but very rarely, for such is the effect of the laceration, whether by opening the cellular substance so as to receive the extravasated blood (or in what other way it is immaterial to determine), that even the tibial artery stops by merely applying to it a pellet of lint. If the artery continues to bleed, you must take a piece of sponge well dried, apply it as close as possible to the mouth of the artery, and make one of your young men hold it down for some time with the point of the finger.

But there is another kind of hæmorrhagy still more perplexing; the arteries are sometimes wounded from within by the sharp bones, the blood is extravasated, you open a large ecchymosis with the lancet, in order to prevent extensive suppuration; the extravasated blood flows out, the skin falls down again, no more blood collects in that place, and you think all is right, and have no apprehension of any large artery being wounded, when suddenly, and at the distance of two or three days, a considerable artery begins to bleed from the bottom of the sac, and after bleeding outwardly, it threatens (when prevented bleeding openly) to inject the whole limb with blood.

Wherever an artery thus threatens to produce successive and dangerous extravasations into the cellular substance, you must cut up the skin and muscles to the place where the bleeding artery is, and although sometimes you may have occasion to use the needle, generally (even in this kind of hæmorrhagy), you have but to apply a piece of sponge.

Let us next suppose, that the fracture is made by a shot ; that a gardener, for example, has loaded his fowling-piece with slugs (for watching his fruit during the night), and having forgotten to draw the shot, some unwary person, perhaps in play, has fired it at another, and standing quite close to him has wounded him in the leg or thigh. There is in this case comparatively little bleeding, the hole is round, and admits your finger ; some of the shot has passed through, some has remained in the leg ; the bones are entirely broken, or more properly shot away ; your finger, especially if there have been a ball in the piece, passes through the centre of bone as clear as through the rest of the wound. In this case, the best instrument for removing the splinters of bone, the shot, and foreign bodies, is the finger ; if you find particular splinters of bone, or if you feel shot flattened and nixed in betwixt the splinters of the bone, you work them out with your dressing forceps, or you use any small lever to pick them out with ; and finally, to clear the wound of any pieces of cloth, &c. which may have been carried in with the shot, you may take a strap of fine linen, and with your long iron probe pass it like a seton across the wound, and draw it through, by which you entangle any very loose splinters of bone or piece of cloth.

OF REDUCING THE PROTRUDED THIGH BONE.

Let us next suppose, that in place of the leg, the thigh itself is fractured, not by a carriage passing over it, nor by being caught in the machinery of a mill, nor by the falling in of stones in a quarry, but has been fairly broken or snapped across by a fall, and driven through the skin and flesh. When the thigh bone protrudes thus, it protrudes forwards, and pierces the thick flesh of the thigh, making its appearance through the very centre of the Rectus and Crureus muscles. There is indeed less of irregular laceration than when two bones, as the Tibia and Fibula, are broken; there is in general one simple wound, and one pointed and projecting bone, but the strangulation round the bone is great, the reduction of it by extending the limb is almost impracticable, the finger is not allowed to pass into the wound, and when, by a little dilatation with the bistoury, the finger is admitted, the surgeon feels sensibly strong bridles of the muscular flesh, and considerable resistance from the tendinous firmness of the Fascia-lata. This is the case where (whatever we may determine as to the pinching off of splinters, or reducing the bone to a right shape) we choose to dilate the wound, both because of its natural narrowness, and because there would be unquestionably great danger of stricture were the Fascia-lata left entire; for when the whole thigh is swelled, the tension of the fascia makes that inflammation run into gangrene, which might otherwise have passed on to an easy suppuration, or might almost have admitted of adhesion.

In the thigh, then, so fleshy and muscular, and

covered with this firm Fascia, the blunt bistoury should be carried pretty boldly forwards, and the wound very freely dilated.

When a loaded carriage passes over a limb, when it is so squeezed in the wheels or rollers of machinery that its very marrow is pressed out, and large pieces of the bone forced through the wound, still the remaining part of the bone, far from being destroyed, lives and replaces the lost piece! When bones are protruded, and so pressed and locked in with one another, that none but the roughest methods can disentangle them; when it becomes necessary to wedge in a lever betwixt them, and poise them asunder, no part of them is destroyed, but the ends of a bone thus roughly handled live and unite with each other! When a loaded carriage has passed over a limb, recoiled and passed over it a second time, and then by the whipping-up of the horses has passed a third time over it; when the limb hangs double like a piece of flesh; when the bones are so crushed that the fractured part feels like a pap or mash, and no bone can be perceived in it, even then the bones, though crushed into impalpable pieces, do by no means lose their vital principle! such a limb sometimes heals with hardly any exfoliation of bone. When a person, perhaps leaping from a height, or running with violence, has broken the leg, he not unfrequently runs headlong two or three paces, the broken tibia (its medullary canal open), striking into the soft ground; and often a person falling from a tree, or buried with earth by the falling-in of buildings, has had the broken tibia driven deep into the ground, the foot being necessarily turned to one side, and yet the bone preserves its life and reunites

with the soft parts ! And what I have next to remark is quite a common accident, that when a compound fracture happens from the falling-in of quarries or coal-mines, the coal slack, the lime, the soil and gravel are so rubbed and mixed into the flesh and bones, that the bones are absolutely black, and yet being carefully cleaned, the flesh and bones perfectly adhere, or with very small suppurations.—No one can be surprised at these facts who has speculation enough to observe the condition of a fractured skull, where the parietal bone, for example, is fractured, depressed, trepanned, and raised up again, without its organization or vital principle suffering, or its circulation ceasing for a moment ; it immediately reunites with the integuments, and with the adjoining bone, or if left bare of integuments, begins in a few days to granulate of itself.

No explanation can be superfluous which serves to give you confidence in replacing fractured bones ; what I have explained is one of these general and important facts concerning the tenacity of life in bones which nothing but much experience could assure us of. This confidence the older surgeons wanted altogether ; they kept bones always naked, they of course saw them always exfoliate, till this exfoliation came at last to be considered as a necessary and important step in the process of healing ; Petit absolutely wrapped pieces of linen rag round the ends of the protruded bone to ascertain whether they were or were not alive, and he continued to dress the ends of the bones apart till they exfoliated ! but these pretences of Petit and other surgeons, of dressing with balsams, &c. parts which could be so very little benefited by any care of theirs, made the

practice the more ridiculous. But exfoliation was the doctrine of the day, the older surgeons believed that no bone could heal without exfoliating, and that no wound could be cured without suppurating; they were at pains to wrap up in rags, to cauterize, to burn a bone, to keep it apart from the flesh till it exfoliated, for the same reason that they kept a wound open! for they would permit no wound to adhere, they would have it to suppurate, incarne, and cicatrize; that they reckoned the only true canonical cure.

To doubt the life of the bone, and to insulate it thus, is to kill it; and since it was by wrapping up the bone in rags, and keeping it separate from the soft parts, that the older surgeons forced the ends of the bone to exfoliate, or, in other terms, destroyed its vital powers! we may be sensible that the best means of preserving the life and circulation of the bone, is by restoring, as far as possible, the continuity of vessels. Nothing is more necessary towards the healthy action of vessels than to be opposed to other living vessels: remember this principle in managing protruded or naked bones, whether in wounds, in fractures of the skull, or in compound fractures of the limbs; leave in their place all bones that are not absolutely destroyed, as by shot; separate none but what come easily away; be satisfied that where a piece of bone sticks firm, there will be vascularity enough to support it; reduce the protruded bones, and lay the soft parts close round them, that, if possible, they may adhere.

[This passage requires some commentary. How a bone may have suffered, is not the question. It

ought rather to be, What is the state of the soft parts? And this makes the nature of the force always an important part of the case for consideration. If, for instance, the bone is broken by a man having leaped from a carriage, although the thigh bone or tibia be pushed through the skin, the integuments, muscles, blood vessels, and nerves, have not suffered. But if, on the contrary, the wheel has passed over the limb, when the bone has been broken, the integuments cut, the muscles and vessels bruised, and perhaps irrecoverably, at first, and to the eye, the circumstances of the two cases are similar; but in the after stage, the nature of the inflammation, the colour of the skin, the vesications on the surface, and the coldness of the extremity, sufficiently point out the bruised limb, as contrasted with the compound fracture. If we have to determine the question of amputation, it will turn on the condition of the soft parts, not on the state of the fractured bone.]

OF DRESSING THE WOUND.

Your assistants have held the limb steady, and somewhat extended, and you have picked away the loose bones, reduced the protruded ends, stopped the hæmorrhagy, and cleared the wound of any gravel or soil that was forced into it; you now lay the eighteen-tailed bandage on the pillow; you lift the limb gently, and lay it upon the bandage; you and your assistants draw the limb gently, steadily, and with considerable force, model it with your hands, and give it a seat on its pillow or splint, and then proceed to close the wound. I defined a com-

pound fracture to be, that which from the great laceration sometimes gangrenes, and often suppurates ; but with care it may frequently be made to adhere. This is always to be your object.

When, after a simple fracture, the patient, by falling forwards upon the broken limb, has forced the tibia or thigh bone through the skin, the wound is not large, the flesh is cut, and not much lacerated; it is not only possible to make it adhere, but perfectly proper (after reducing the bone), to bring the lips as close as possible, and stitch them together, as you would do the integuments after the great operations of Hernia or Trepan. When, after a more terrible accident, the limb being torn by machinery, or by carriages passing over it, the laceration is great, you may be able, with the help of the needle, to bring two points of the wound together ; but the sides can seldom be made to meet fairly, stitches are seldom useful, the sides of the wound are to be generally supported, by laying small and thin pieces of lint on each side of the wound ; these pledgets of lint are soon soaked with blood, which cakes and adheres to the open part of the wound. By making small rolls and compresses of linen and soft lint, which you lay upon the edges of the wound (at those particular points where you apprehend a gaping of the lips, or where you apprehend that suppuration and cavities will form), you keep the parts very close. You then lay up the tails of the eighteen-tailed bandage about the limb, and though you cannot use a roller (because that would require the lifting of the limb from its pillow at every turn), you give as much firmness as possible with the eighteen-tailed bandage. The steady firmness with which you support the parts helps the

adhesion, prevents suppurations, and hinders an afflux of blood to the limb; over all, you may pour a little of some spirituous balsam, as the Balsamum Traumaticum.

When the limb is thus dressed, the wound which, while the bone protruded, seemed so very formidable, is very small, the pain is relieved, the very firmness of the limb is agreeable to the patient; you then apply the outside splints close to the limb, tie them moderately firm with their ribands, and having, perhaps, bled your patient *, you give him an anodyne and compose him to sleep; it is now that a situation which seemed very desperate is changed into a state of hope and expectation †.

* Perhaps, because it depends on constitution, time of life, and situation.

† The eighteen-tailed bandage, called by the Germans, from its resemblance to a book, the book-band, is made by sewing the cross-tails obliquely upon one middle piece of linen, which holds them together, and keeps the several tails regular.

The navy and army surgeon, and especially those who go abroad on active service, should have store of every thing necessary for fractured and wounded limbs; of oil-cloth, not to lay the limb upon, but to lay upon the bed under the splint at the time of washing the limb; sponges for cleaning the limb with; pasteboard for the slighter fractures, as of the fore arm; thin shaven wood glued on leather, and then split with a penknife, for the fractures requiring firmer support; numbers of rollers, firm, and made of linen—for flannel ones are very filthy, by soaking up the matter, and very useless for want of firmness. He should have glue, which he will find very useful on various occasions, even of common wounds; he should have sheet-lead, which being glued upon pasteboard, makes a very firm and perfectly flexible splint, which is at the same time easily cut with scissors or a penknife; he must have tin-plate also, which being cut with coarse scissors according to the size and form of the fractured limb, can be pinched and turned easily with the thumbs, or can be easily hammered into a nicer form. In simple fracture of the thigh, a tin case, lined with fustian, takes a good hold of the surface, and forms the machine of Hildanus; or in compound fracture of the leg or thigh, a tin case being fashioned and bended to the shape of the limb, and lined with oil-cloth, makes a safe and cleanly case, by which the patient can be conveyed safely at the

OF THE STAGE OF SUPPURATION.

Though you expect to procure adhesion, or at least to make some part of the wound adhere, you are often disappointed; you are sensible, from the violence of the fever and the swelling of the limb, that mischief is going on within. The dry skin, the parched mouth, the thumping pulse, the restlessness and delirium, continue for some days, and there is a blackness round the wound threatening gangrene. But this fever by degrees becomes less violent, the livor, which proceeded partly from ecchymosis, partly from the dark colour of the inflammation, gradually changes to green, the great wound begins to suppurate and open very wide, the whole limb swells to an enormous degree, the skin and cellular substance are soft and relaxed, and bear the impression of the finger, the redness extends over all the limb, and from the particular hollowness and softness of certain points, you are sensible that great suppurations are forming within.

All your prudence, and more especially all your diligence, is required for conducting this stage of the disease. You are careful to dress the limb every morning, and perhaps to clean it also a little in the evening. By regular washing and wiping with the moist sponge, you prevent those smells which depress the patient's

time of the accident, and in which the limb may lie easy during the cure. The limb being washed and cleaned with sponges, may be padded up again at each dressing, by thrusting in little dossils of tow and scraped lint under the hollow parts, to equalize the limb, and raise the heel. A man is no more fit to be received into the army or navy, nor indeed to practise as the surgeon of a village, who is not able to make splints for himself out of the most ordinary materials, than a man is to announce himself as a dentist who cannot make artificial teeth.

spirits, and injure his health; and by laying clean lint to the wounds twice a day, you soak up the foul matter; by the occasional use of spirituous tinctures, you stimulate the skin, and keep it in good condition; by washing the excoriated parts with salt water, you relieve the itching. You examine the hollow and yielding parts of the limb carefully, and after each fit of inflammation, you feel anxiously with the point of the finger for any abscess it may have occasioned. You find new suppurations produced, sometimes by the extravasations of blood, sometimes by the pricking of splinters, or sometimes from matter lodging in hollow places; you open such abscesses with the point of the lancet, soak up the matter with scraped lint, and lay small compresses upon the hollow places, by which you heal them, and make the internal parts unite.

This is a plan of conduct altogether opposite to the filthy oil-cloths, pillows soaked with matter, rancid poultices and fomentations, in which you so often see a limb going to destruction. By thus carefully cleaning and dressing the sores, you make such changes, that in the course of a few weeks, a limb which had been condemned by a consultation, is manifestly saved.

The importance of attending to the general health, and even to the most trivial circumstances connected with the ease and comfort of the patient, is very great; you should be careful to have the windows open and the room ventilated, to change the linens, to make your patient wash his face and hands with cool vinegar and water, and when the matter is very profuse, to have the room fumigated with vinegar. You give nourishing food in small quantities, wine according to the constitution and habits of the

patient, anodynes according to the degree of pain, fever, or restlessness, and laxatives when they are required. You give the Julapium Sistens and other astringents, and anodynes when the diarrhœa is violent; you give sometimes gentle emetics upon the attack of nausea and fever; and as for bark, I believe, in place of reminding you to give it when the suppuration is great, I must rather (so common is this prescription) advise you against overloading your patient's stomach with this heavy drug! three or four drachms of bark is enough to sicken the appetite of a man in health, much more of a man confined for six months to lie on his back. You therefore give him a light infusion in a draught, with suitable additions.

How much is due to care and cleanliness, you may judge from this, that in the case of a gentleman who lies in his own house, we often venture to save a limb, which, had the accident befallen a poor man lying in a crowded hospital, must have been cut off. In hospitals, especially in military hospitals, and most of all in hospital ships (which the lords of the admiralty would do well to burn), the patient sinks almost inevitably under the suppuration of a compound fracture.

Often it happens, from the destruction of parts, or the unhappy circumstances of the patient, that all your cares are unavailing! every time you examine the limb, you make discoveries of more extensive destruction, you find the whole limb swelling every day more and more, you find the matter running profusely from the openings, the openings increasing in number, and the suppurations extending from the ham to the heel with intolerable fœtor, the muscles

all undermined, and the bones carious. You find that you are no longer able to support the patient's health, that repeated attacks of diarrhoea and fever have reduced him to extreme weakness; and the wan visage, the pale and flabby flesh, the hollow eyes and prominent cheek bones, the staring and squalid hair, the long bony fingers and crooked nails, the quick, short breathing, and small piping voice, declare the last stage of hectic and debility! the natural powers are then sunk so low, the appetite for food, and even the desire of life so entirely gone, that we would believe the patient past all help, did we not know by experience that it is never almost too late to amputate the limb.

Now, it is come to that crisis when our patient must die or part with the limb he has suffered so much to save; but he is wearied out with suffering, and consents easily to whatever we advise; and whatever the difference of opinion on the first consultation, when the limb was first laid on its pillow all bleeding and shattered, with its bones projecting and its arteries torn, there is none now that it is thus undermined with suppurations, with universal caries of the bones; the first was a state of expectation, the second is a condition where we must despair. When we are thus sensible that further attempts to save the limb are incompatible with the life of the patient; when we perceive plainly that the limb thus mangled, shortened, and imperfectly cured, would be rather a load to the patient, and a perpetual reproach to the surgeon, we perform amputation! there can be no difference of opinion now, because the experiment of trying to save the limb has been tried, and has failed.

It is in the lower extremity only, which bears the whole weight of the body, that we are to look for the worst cases of compound fracture; and however a compound fracture of the arm or fore arm may destroy the part itself, life is actually in danger only in great fractures of the lower extremity, which forms so great a proportion of the whole body. The ankle joint is never dislocated unless when the Fibula gives way; it is never entirely distorted, and the foot turned transverse, without both bones, both Tibia and Fibula, being broken; and when it is entirely dislocated, the integuments are torn at the inner or outer angle, and often the Tibia or the Astragalus are forced through the wound, and the head of the bone on which the body rests quite exposed. If a man falls from a height, and lights with one foot on a round stone, the foot is turned to one side, the integuments are burst, the inner angle or process of the Tibia protrudes, and the Fibula is broken, so that the foot is turned entirely to one side. If, again, a horse rears and falls above its rider, if a man's foot is caught in the machinery of a mill, if a man falls from the back of a carriage and his leg is entangled betwixt the spokes of the wheel, the foot is turned round, the integuments burst, the Tibia and Fibula are more or less exposed, and the Astragalus, or bone on which the leg is supported, is either broken or turned entirely out from its socket, disengaged from the Tibia, and almost separated from its connexions with the other bones of the foot. Whether the Tibia only is protruded, or the Astragalus displaced, or both, you perform the same operations; and whatever may be the decision of a consultation afterwards, your duty is immediately to replace the foot and

close the wound. Always, you proceed in the first instance as if you had no doubt of saving the limb.

In general it happens, that the Astragalus or Tibia having burst through the integuments, the bones are so strangled in a small slit or opening, that no degree of force will reduce them; you do not, in this case, cut off a bone so necessary to the joint as the inner process of the Tibia! you never, unless it be already entirely separated, cut away the Astragalus; you first bend the knee and extend the foot very powerfully, and press in the Astragalus, and try to reduce the bones; but failing in this, you make a free incision, extend the foot, replace the Astragalus betwixt the processes of the Tibia and Fibula, and having closed the wound, you lay a piece of lint upon the lips of the laceration. You then place the limb on a large and stiff splint, in a manner which surely I need not explain, and with such pillows, compresses, and bandages as you find necessary for keeping the foot in its right position with regard to the leg. All this is not easily performed; sometimes bone-setters have two or three of them attempted for several hours to reduce a luxated ankle, but in vain, from not daring to make the necessary incision. Sometimes also the best and most ingenious surgeons have endeavoured in vain to keep the foot right, which, although bandaged to a firm splint, or lodged in a square box, and bent into the best position with compresses and wedges, has been found distorted from time to time. This difficulty I have often experienced, and yet must leave you to your own ingenuity, for you have time to contrive means of restraining this tendency of the foot to turn aside, and the contrivances are of the most obvious kind.

The limb being thus laid, you are not to promise yourself absolute success, but the surgeons whom you have sent for being arrived, you consult together upon the probable event of the case; and so very favourable is the aspect that matters assume after those operations have been nicely performed, that the consultation will very rarely order the limb to be cut off; they soon leave you to your own prudence, and advise in general terms that every thing should be done to preserve the limb. You are now afloat, and must abide the chance of time and circumstances, for after a day's delay the limb is inflamed, and you never call a second consultation; it is too late (whatever changes come upon the limb) to perform amputation with success; nor, indeed, must you be alarmed at the appearance of gangrene, even in this case, where gangrene is so often the cause of death, for the force with which the parts are twisted, or the bones driven through the skin, occasions an extensive ecchymosis, which reaches along the leg and up the thigh itself, so that the whole limb is almost black. Nay, you must not lose all heart even though this blackness turn into a true gangrene, though vesicles rise, the part lose all feeling, and the patient lie in a degree of stupor; for such gangrene is often but superficial, it is confined to the skin, it is limited even to a small portion of the skin, and in eight or ten days small sloughs are thrown off, the suppuration is established, and the patient revives. Such laceration seldom or never adheres immediately, yet is often cured by suppuration; and sometimes when pieces of the Tibia and Fibula have been separated and thrown off, when the Astragalus has been fractured, and one half of it cut out by the surgeon, the

joint has healed ; nay, it has even happened that the Astragalus has been so entirely twisted out of its place, that it has mortified and been removed by the surgeon, and yet the gangrene has ceased, the suppuration has been established, granulations have filled up the great hollow, the outward wound has closed, and (though it is difficult to believe so surprising a fact) the bone has been so far regenerated, that the patient has walked firmly on that point, and with a free motion of the ankle, a new joint having been formed. Yet you should be aware, that such cures are never perfect ; after even the least of those accidents the joint continues long weakly, always rheumatic, apt to swell with the slightest fatigue, and requires to be firmly supported by a well padded buskin laced firmly round the joint ; I have seen some patients, indeed, who did not absolutely need this, but few who did not acknowledge the comfort, security, and strength it gave them.

OF THE QUESTION OF AMPUTATION.

I have hinted, that a consultation of surgeons might condemn a limb in the first moment (while lying in a shattered and disordered state), who, upon seeing it reduced and dressed, would find reason for hope, and would be not unwilling to trust to time and good conduct ; and I have taught you not to be rash in sacrificing a limb, not to be absolute and decisive in any case, that only excepted where the experiment of trying to save the limb has been tried and has failed ! where the patient is dying from profuse suppurations, but so slowly as to give time for both surgeon and friends to be convinced that the

amputation is a matter of necessity and not of choice.

I have just mentioned, that in luxation of the ankle joint, even the Astragalus, the great bone of the joint (a bone not inferior in size to the head of the thigh bone), may be displaced, separated, and cut entirely away, and yet the limb be saved; yet this, Gentlemen, is the case in which, according to my experience, gangrene is so apt, or rather so sure to happen, that those who have been saved after such an accident have been saved by chance, while hundreds have died of the gangrene which usually ensues. A successful case now and then in a medical journal obtrudes itself upon your notice, but it is one case picked out of ten thousand. When you are called to a case of this kind, you take immediate measures for restoring the parts to their natural situation, and putting the patient in a state of ease and comparative safety; but your chief duty is that of calling together a consultation of surgeons, to decide whether or not you should attempt to save the limb. The mention of this question never returns without producing serious impressions on my mind, and I believe I cannot close these Discourses more usefully or respectfully, than by saying a few words on the subject.

I am sorry to observe this, the most important question perhaps in surgery, treated as if it were no question, but rather a rule of practice, which might be established on the most absolute grounds! When a surgeon condemns a limb, he does not say, that if amputation be not instantly performed the patient will die, nor is he disappointed if the limb be saved; he thinks both more sensibly and more humanely.

He knows that there is great danger of losing the patient's life in attempting to save his limb, and reckons it his appointed duty to advise amputation ; but he is still sensible that the limb may possibly be saved, and often, after his honest opinion is rejected, contributes, by his attention and kindness, to that most desirable object. Sometimes he feels it to be his duty to advise amputation, and to represent very strongly the manifold dangers of attempting to save the limb, while yet he rejoices to find his patient willing to hazard all those dangers, in favour of an object which it must be the chief honour of the surgeon to accomplish.

But there is yet another thing to be regarded, as well as the great object of saving the patient's life, for there never is an unqualified and perfect success. The patient feels nothing but the desire to save himself from the deformity and lameness which amputation causes, little thinking how deformed and lame the limb may prove after he has passed through every kind of danger and suffering to save it. But we have much more to reflect upon, and much broader grounds for reasoning. Let us but consider, if (in a case of very dangerous fracture) the man die, how great the loss, the disappointment, and the regret of friends ; even if he live, how great his own sufferings, and how imperfect his cure ! A man, for example, in the middle age of life, has his limb crushed, so that consultations are convened on the question, and it is thought just possible that it may be saved ; he is laid in bed, and the necessary operations of dilating the wound and reducing the bones are performed ; abscess, caries, hectic, and every kind of distress ensue ; for two years he lingers in his house, and

then is carried to a succession of watering-places in hopes of recovering his health. He is lame and walks on a stilt, and his natural constitution has received an irreparable shock ; he falls in the course of those two years of distress, from the condition of a young and healthy man, to the state of a valetudinarian, dispirited and dejected, travelling now the downhill way of life : he has lost his health and saved a limb, which he drags after him with labour and pain.

Now this is much to be regarded, for often the limb is so ruined, that no surgeon could wish it saved. The surgeon in condemning a limb, regards its mangled condition, and can hardly be so imprudent as condemn that limb which is so little disordered, that it may not only be saved, but may become shapely, strong, and useful. The present dangers of the patient, the danger of losing his constitution and health, and the mangled and hopeless form in which the limb lies before the surgeon, all bear upon his mind, when he declares with reluctance that it should be cut off. When the case seems thus hopeless to the surgeon, the complication of chances is very intricate. The patient may die of the immediate injury and gangrene ; or he may survive, while the limb, already seized with gangrene, may be destroyed, separating naturally, or with a little help from the surgeon. The limb also may be saved, as well as the life ; it may escape the gangrene, but the degree of injury which threatens gangrene usually leaves a limb so deformed and shortened, that it proves a mere load and encumbrance to the patient, and hardly an honour to his surgeon. Lastly, The limb may, notwithstanding this dreadful and complicated injury, turn out a clean, shapely, and useful limb ; but how

small the chance of this perfect recovery, after the limb has been condemned by a judicious and humane man, who understands his profession, and has added experience to knowledge !

But let us not argue this as an abstract question, but come to some sensible and visible proofs. First, I suspect, and indeed I dare affirm, that often the surgeon repents of the limb he has saved at the risk of the patient's life. La Motte having saved the life of a young man who had his arm and leg both cruelly fractured, by his horse falling with him upon ice, acknowledges that paralysis of the wounded side came on a few days after the accident, and that he was so imperfectly cured that he dragged the limb after him entirely lame ; he then asks the question himself, " May it not be doubted, whether we should not in such a case have judged more wisely in amputating the limb * ?" But other authors as ingenious, as worthy of credit, leave no such doubts, do not apologize like La Motte, by saying that the boy, even in this condition, preferred his own mangled limb to a wooden one, but declare to us plainly, that their patients, though old and of a humble station, could not endure their situation. " Esther Parsons," says Mr. Lucas, " was admitted into our infirmary with a compound fracture ; one of her legs was taken off above the knee ; from the other leg, four inches of the tibia were removed, and due pains taken to make the woman as comfortable as her deplorable situation would allow."—" After a confinement in bed for upwards of *ten months*, various attempts were made to support her on crutches ; but after trying

* "Doutant si dans le commencement nous n'aurions pas mieux fait d'en venir à l'amputation," &c.

this for a few weeks, she endured so much pain, that she begged to have the remaining limb amputated, for it was to a degree burdensome to her, without a prospect of any amendment*.” This patient now was a woman, with all the fears and delicacies of a woman ; was advanced in years, and reduced by suffering of every kind ; her employments sedentary, and her sex not requiring any active way of life : she had felt the pains of amputation and the loss of a limb ; she could compare her future situation with her present misery, and yet such was her sense of the distress of carrying so unwieldy a limb, that though just returned as it were from the dead, she was ready once more to submit to a terrible and dangerous operation. I myself have seen a patient require the amputation of such a limb, and have seen it performed : it was crooked in behind the sound one, and was a serious occasion of distress and trouble.

Secondly, I suspect, and can also venture to maintain, that surgeons often give a favourable report of limbs too miserably shattered to be soundly healed, only because they have had the good fortune to preserve them. But had it so chanced, that the surgeon had condemned these same limbs, and the patient refusing the surgeon’s advice, had persisted in preserving them, we should have had them described in very different terms. One of the oldest of the modern surgeons, in a fit of peevishness, has let off a description of this kind, which has amused me. “A young lady,” says Saviard, “Mademoiselle Duclos, on the eighth of November, 1694, was buried, along with numbers of others, under a pile of wood ; twenty

were killed, but this lady escaped with a dreadful fracture of the leg, in which the astragalus was luxated, and indeed quite turned round, while many splinters of bone protruded through the skin. The limb was in a condition which, according to all rules of good surgery, required amputation ; but Messrs. Bessiere, Gigot, and myself, though we delivered one unanimous opinion, could not persuade her to submit to amputation : all our arguments, prayers, and entreaties were in vain. After many months of suffering, and various suppurations, she was at last cured, with the loss of the lower head of the tibia, especially that portion which articulates with the astragalus and forms the inner ancle."

"This lady remains," says Mr. Saviard, "in the very condition that Mr. Bessiere and myself predicted, walking on stilts, dragging after her an unwieldy and shapeless limb, distressed with frequent pains, while, by submitting to the operations we proposed, she might have escaped indescribable distress during this very tedious cure ; she might, indeed, have been very soon cured, and soon able to walk with pleasure." It is, no doubt, an unhappy sight for a patient to look to his wooden leg, and reflect that it is possible his limb might have been saved to him ; but let him compare his condition with that of a person dragging after him such a mass of macerated flesh and crooked bones.

I believe I shall give the clearest view of this subject, by telling you that I do not regard the most perfect success as a proof of judicious practice. I will even venture to describe one of the most unprecedented examples of success in the cure of a bad compound fracture, as an instance of that very situ-

ation in which the limb ought, by all the rules of surgery, of prudence, and of common sense, to have been cut off.

It is a case related by the celebrated Verduc, nearly in the following terms: A man about seventy years of age was thrown down by a waggon, in a street where the declivity was very steep; he fell flat upon his face, the wheel went over his leg and fractured it very cruelly. The driver, confounded at what had happened, allowed his waggon to recoil, and the wheels running backwards on this steep declivity, passed over the old man's limb a second time, then the villain seeing what destruction he had made, and expecting to make his escape, whipped up his horses and drove his waggon a third time over this shattered limb. "When the wounded man was brought to me," says Verduc, "I saw a great wound in the lower part of the leg, with a prodigious hæmorrhagy, and then taking the leg in my two hands, and bending to the inside and outside, I perceived that it bowed on all sides, and had no other stay but the flesh; and to make this accident as formidable as in nature it could be, the old man had an ulcer with caries of the bones, at the very part of the ankle where the wheel had passed and repassed, which carious ulcer he had suffered during forty years."

Verduc stopped the bleeding with lint and compresses, and astringent powders. He put two splints as props under the fractured part of the limb, laid his patient on a ladder with quilts under him, and had him carried home: in carrying him up stairs, the limb, in spite of every precaution, suffered a good deal. After laying him in bed, the limb was again dressed more regularly and carefully; the hæmor-

rhagy was suppressed, yet it returned again, so that at midnight all the dressings needed to be renewed. Next day another surgeon was joined with Verduc in consultation: they found half the leg and all the upper part of the foot gangrenous; amputation was proposed, but Verduc by his particular care stopped the gangrene and saved the limb.

Let us next observe, according to the regular course of the narrative, what this old man suffered, and how he was cured. The sloughing of this superficial gangrene of course carried away the skin; the muscles which bend the foot lay exposed and quite putrid, so that the surgeons needed to make deep incisions into them; and by the tenth or twelfth day, the tibia (long carious and now destroyed by the fracture) lay bare to the extent of two or three inches, and was as black as ink; the Tendo-Achillis was also exposed. This was the first disorder produced by the gangrene; and you may judge of the state of the limb, after the exfoliation of the tibia, by this, that the want of the tibia so enlarged the hole into which Verduc was accustomed to throw his cleansing injections, that you could see through and through the leg! while the shattered fibula on the other side produced (by its points sticking in the flesh) a succession of suppurations and ulcers.

After six months the condition of the limb was little improved, the fibula was still exfoliating, the abscesses were renewed from time to time, the fibula was bare and carious, and Verduc was busied applying actual cauteries to the bone at each dressing; there was formed also a gangrenous ulcer of the heel, which required the limb to be lifted and dressed daily for two months. Nor is it to be forgotten as a real

picture, both of the sufferings of the patient and of the diligence required on the part of the surgeon, that through all the six months during which the corruption and putrefaction, and various grievous disorders lasted, Mr. Verduc employed every day five or six hours (including morning and evening dressings) in preparing the apparatus and cleansing and dressing the sores.

“I reckon,” says Mr. Verduc, “that this complicated fracture may serve as a model and general rule for all that I can say upon this head : but what was the happiest circumstance of all, the patient recovered perfectly in the space of eighteen months ; six months after he walked, at the age of seventy-two years, without a cane, and he lived nine or ten years after.”

So happy a circumstance was this recovery, that I think it almost a miracle ; so great was the merit of Verduc in preserving this limb, that he was, in my opinion, much to blame in making the attempt. Such pains as he took were very commendable, but then “all his service in every point twice done, and then done double,” was but a poor recompense for the rash attempt he had entered upon. The man survived, and Verduc had a proud tale to tell ; but had he died ! what could Verduc have said in vindication of himself, hazarding in this manner the life of so old and diseased a creature ? Were this very case submitted to my judgment, should an accident in all respects parallel happen again, I would reflect on the case of this man only as a mere exception, as an example of what a man will come through who has a powerful, unsubduable constitution ; I would take this very case as a warning, rather than an example, and give an opinion directly opposite to that of Ver-

duc. Were a man of seventy years of age, his leg ulcerated to the bone for forty years, to have his leg not only fractured, but miserably crushed by a loaded carriage passing three times over it ; and were there, in addition to the fracture of bones already carious, a violent hæmorrhagy ! I would say, “ It is not impossible this man may survive ! We are met here in consultation, whether we shall or shall not amputate his limb, which implies that we know it to be possible that he may survive ! we read in Verduc of such a case, in which the man lived ; but his escape is reckoned by all judicious surgeons to be a miracle ; and the more it is a miracle, the less is it an example. In that very case, the hæmorrhagies, the gangrenes, the sloughings, and the exfoliations, were such as put the man’s life in daily jeopardy ; and of the ten years he had to live, he lingered out two, in the filth and misery of a sickbed. Therefore, notwithstanding this case, recorded by one of our most respected authors, I advise for this old man as I would judge in the case of my own parent, that the limb be cut off without delay.”

Pott himself escaped with life after one of the worst compound fractures ; yet Pott approves of amputation, and disapproves of Belguer’s opinions, of his books, his practice, his translators, and abettors in this country. The most ingenious men differ on this important point ; and there is a reason for that variety of opinions with which in your future studies you may be perplexed. One surgeon advises amputation, and gives alarming representations of the dangers attending a compound fracture ; to him it appears, that the attempt to save a lacerated limb is almost certain death : but he is one who has prac-

tised in the hospital, or in the unhealthy suburbs of some great city, where the lower ranks of people swarm in filth and wretchedness, where in all seasons fevers and infection prevail. Another declares loudly against this destruction of limbs, declaims about the powers of nature and the constitution. But we find that he has practised among hale country men, labourers, workmen, and villagers, whose robust constitutions withstand every shock, and who recover after being buried in quarries or the ruins of buildings, though dragged out but half alive. Another, who has practised in some great mercantile town, presents you with instances of the most extraordinary crushing, distortion, and mangling of the joints and bones; relates cases where men little less mangled than if they had been broken on the wheel recover perfectly. But are we not to conclude, that such extraordinary cases are merely the exceptions to the general rule? Those are the wonderful cases which obtrude upon our notice in every medical collection, yet they are rare and solitary instances of success, while the number of those who die is unknown; their numbers, if fairly reckoned, would constitute the general rule; but who has an interest in collecting examples of gangrene and sudden death?

The army surgeons of different countries, and even of the same country, hold opinions directly opposite to each other. In one season or country, in one hospital, or after one particular battle, the men are healthy, the wounds heal as by miracle, and few amputations are required; but in another battle, in unhealthy camps, in sickly seasons, in places where the men are exposed to cold, moisture, infection, and

want, all those whose limbs the surgeon attempts to save, perish.

You must be persuaded then, that in respect of this great and interesting point of practice, there can be no absolute rule in nature ; nor is it possible that any single man should be qualified, by practising in various climates, seasons and situations, by feeling in his very person all those influences, to lay down any absolute rule. No man of good sense will venture even to imagine himself capable of ascertaining this question ; and the person the most inclined to establish absolute aphorisms on this difficult point would be least of all entitled to the public confidence. Time, place and circumstance, always modify the question, and give a peculiar and individual character to each particular accident. Those who, in their writings, maintain the most opposite opinions, would not, I believe, debate one moment, if brought to the bedside of a patient to consult about a particular case.

It is with the hopes of awakening your attention to a great and important question that I have touched on it in this place, and it is to furnish you with matter for reflection that I have been at pains, through all this tedious volume, to lay before you, in a minute, particular, and somewhat of a dramatic form, the most ordinary accidents of practice. When such difficulties come upon you, read, reflect, retire within yourselves ! and may you, as you advance in years, have the comfort of believing that you have, on every trying occasion, conducted yourselves with honour, integrity, and prudence. It is a happiness which, in our uncertain profession, no human wisdom nor diligence can absolutely ensure.

[“If brought to the bedside of the patient, they would not debate nor have any difference of opinion.” This is perfectly true ; the difficulty is in stating the case, and while the case is not distinctly before us, we are differing not in our practice, but in the degree of liveliness with which we imagine the circumstances that attend the accident. I am not sure that my brother has portrayed the cases with his usual felicity in this latter section.

In a case of bad compound fracture, or gunshot fracture, we must determine the question of amputation on the instant ; for, if the operation is to be performed, the sooner it is done the better, as the patient has a better chance of recovery. But on what is the determination to turn ? not on the case before us, but on the previous experience ; so that seeing the condition of the limb, we must, by force of imagination, contemplate what shall be the condition of the parts in twelve hours, in six days, in three months.

In twelve hours, the inflammation, pain, and tension of the whole limb, the inflamed countenance, the brilliant eye, the sleepless and restless condition, declare the impression the injury is making on the limb and on the constitutional powers. In six days, the limb, from the groin to the toe, or from the shoulder to the finger, is swollen to half the size of the body ; a violent phlegmonous inflammation pervades the whole ; serous effusion has taken place in the whole limb, and abscesses are forming in the great beds of cellular texture throughout the whole extent of the extremity. In three months, if the patient has laboured through the agony, the bones are carious ; the abscesses are interminable sinuses ; the limb is undermined and

every where unsound, and the constitutional strength ebbs to the lowest degree.

But he recovers, the sinuses close, and the strength revives ; yet observe his condition : An abscess has formed in the centre of the bone, or necrosis has taken place ; successive inflammations, preceded and attended by fever, attack the limb ; each attack of fever, and every abscess, provides for the discharge of a portion of dead bone, and these portions of bone are coming away for years. In the meantime the patient is lame, confined, and consequently reduced in health.

It will not be admitted that a surgeon, in consultation, has any thing to do with imagination, yet I do not know what else to call that process of thought by which he looks forward, and anticipates what shall be the condition of his patient in the four terms of existence consequent upon his accident ; and I am quite sure, that he will be a safe and cautious practitioner, just in proportion to his capacity of anticipating the consequences of the condition of the parts.

When he sees integuments destroyed, and muscular parts crushed, he knows that these parts must slough off extensively ; and he has to consider whether the age and constitution of the patient warrant him in deciding that his strength will bear up against this, as well as against the fracture of the bone. When he finds the integuments entire, but the bone and muscle injured, he must think what will presently be the condition of the limb—that it will be a bag of loose bones and confined matter ; and he must decide whether a free opening will be sufficient, or if he must take off the limb. If the limb shall be so shat-

tered that amputation is necessary, it must be done before the system partakes of the rising inflammation. Authors write about the second period for amputation, and that it is well to wait for it; but if they speak of cases where the bones are crushed, or cases of bad gunshot fracture, there is properly no second period; for the period of suppuration, which is what they mean, is exactly that time when the limb is universally gorged with effused serum, and when amputation is very dangerous.]

DISCOURSE IV.

OF FRACTURES OF THE SKULL.

I WILL no longer revile the doctrines or inveigh against the practice of the ancients: suffice it to say, that the peculiar nature of their studies begot a passion for operating exceeding all bounds of good sense, propriety, or prudence. The little of anatomy they did know was that of the skeleton, and chiefly of the cranium: they were subtile in the arts of discovering, curious in distinguishing, and inexorable in trepanning fractures: they suffered not the slightest chink or capillary fissure to escape investigation, and were never contented with what they had done, while they had left any possible thing undone; they scraped and widened every fissure, trepanned every fracture, elevated every depression, were unsparing in their openings, whether made with or without a purpose: wherever blood was extravasated upon the

dura mater, they continued to apply the trepan, making repeated openings into the cranium, until they had uncovered the whole coagulum: they scrupled not to apply the trepan twelve or even twenty times, but boasted of it as the highest proof of dexterity: they never permitted even the lacerated teguments to reunite with the skull, but exfoliated every naked piece of bone, *i. e.* scraped it with instruments, or killed it with caustic, not without extreme danger to the brain. This is the rough and cruel surgery of which I plainly accuse them; nor can I entirely acquit the best and foremost of the moderns of like propensities: they also have contributed, by precept and by example, to take away all those decent restraints which should weigh upon the mind of a young man entering into practice; they have indeed declared roundly that the operation of the trepan itself is harmless! as if it were possible that simple fractures of the skull could be really a cause of danger, while cutting it with saws, making large and wide openings, taking off that resistance which supports the brain, and tearing the vessels which connect the skull with the dura mater could be safe.

It is a propensity so natural with men of our profession to rely on the resources of art, and to mistrust nature, that we seem almost to have forgotten how much unassisted nature can do. It is also an error but too common, to prize highly the learning and maxims which we have acquired difficultly; to carry the speculations of the closet into real practice; to retain the prepossessions imbibed during our younger years, after we are called to those manly duties, which require the exercise of sober judgment and plain good sense. The first great difficulty we feel in acting

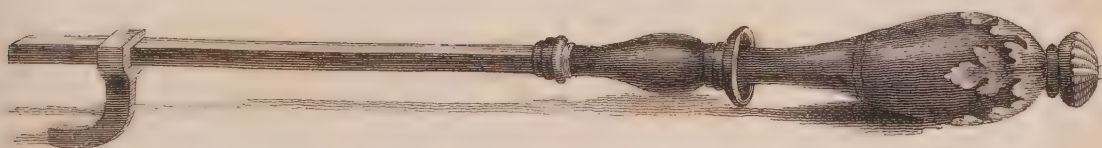
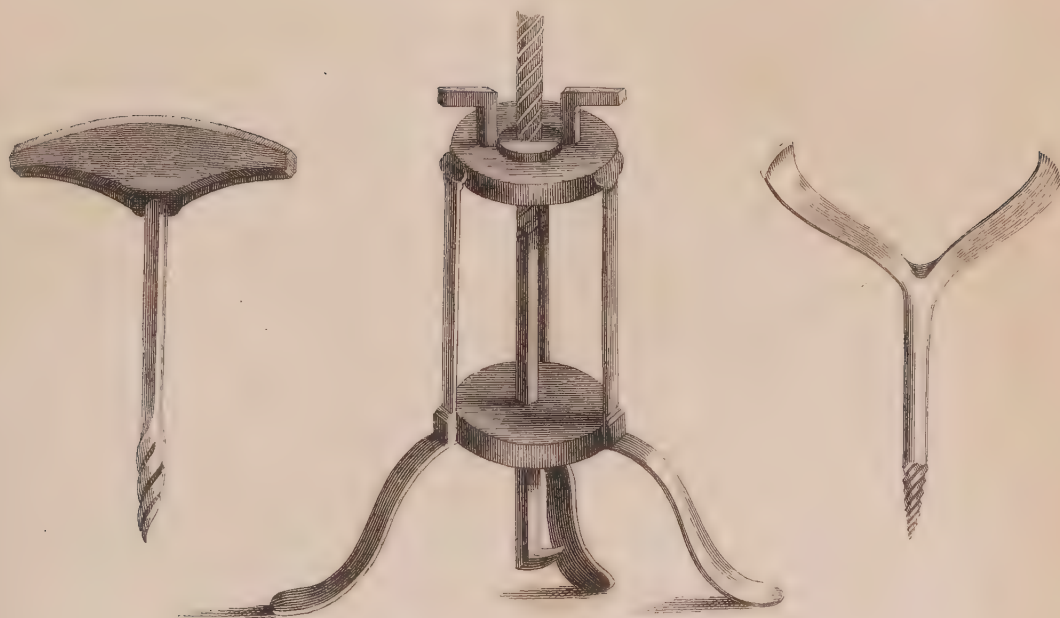
with a just reliance on our own good sense, is that of believing that any thing usually and openly practised can be entirely wrong ; and this again proceeds from our not knowing from what weak men, or from what trivial occasions, many established opinions and practices have arisen. This once explained, the younger part of the profession would find nothing imposing in antiquity or authority, and would trust to the dictates of that ordinary experience and plain sense which is above all learning. Let us turn then to the works of those amongst the moderns who have studied the ancients, prized their learning and adopted their maxims, and whose artificial practice has corrupted ours ; surely it becomes us if not to reform our opinions, at least to inquire into the truth of them, and be able to give a reason for the faith that is in us.

It is very remarkable, that, in each succeeding period of our science, some fatal influence or other has conspired to perpetuate that fondness for operations, which I account the greatest fault we can be guilty of, and the most dangerous to our fellow creatures. The rage for operating reigned for many years uncontrolled, and he was esteemed no surgeon who did not search with all due diligence for fissures, who did not exfoliate every naked bone according to the strict rules of art. Thus the number and extent of the openings made with the trepan was the sole test of merit in operating ; every depressed bone was poised up or cut out with the trepan ; only a few men of natural genius for observation and sterling sense, uncontaminated with learning, ventured to deviate from these rules ; cured wounds without exfoliating ; looked unconcernedly on fractures without trepaning ; left even depressions unreduced, and did

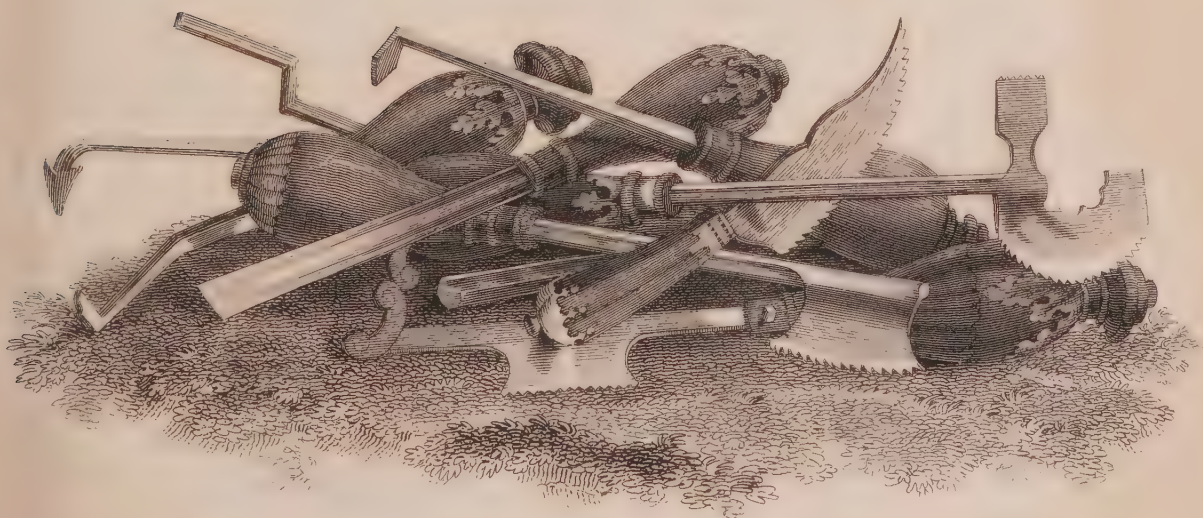
no more, when they put their hand to the work, than circumstances strictly required. The cures they often saw achieved by nature, have been regarded merely as exceptions; yet I fear that those natural cures have been but too often anticipated, sometimes prevented by our precipitate operations: and I hope so to recommend those exceptions to your notice as to incline you to consider them in a far more serious light, not as exceptions, but as examples of genuine good practice, and the elements of your reasoning. I shall never divert you from giving every help in fractures or depressions, but I shall attempt to set just limits to that servile adherence to maxims of past ages, and to that boyish, busy, meddling disposition, which I have too often witnessed. The numerous inventions of chisels, saws, scraping irons, and tools of various forms for cutting the skull, are a sad monument of the vicious practices of past ages. The instruments I represent in the annexed plate are now fallen into disuse, but the prejudices of those times have not disappeared.

In the later and better times of surgery, when, in the great hospitals, every surgeon of eminence practised under the public eye, and was answerable to the profession for his doings; when, from the study of anatomy, the decline of false learning, the gradual accumulation of knowledge, and the improvement in real and practical skill, plain sense came to be valued, rules, such as had been transmitted by the ancients, could not continue to hold any influence over the public mind. But at this auspicious period, those very institutions which promised fairly, and were fairly designed for the improvement of observation and pathological inquiry, actually revived and

p. 298. Vol. II.



Antiquated forms of Levators.



*Saws Rugines and pointed instruments of various forms
for scraping and widening Fissures & Fractures.*

strengthened the passion for operating. A society of men was convened in France, by the most ostentatious of all their monarchs, who seem to have been intent on discovering nothing but wonders ! wonders of art and wonders of nature ! “ Who discovered and proved to the young surgeon, that he may freely open abscess of the brain, search into its very substance for foreign bodies suspected to be buried in this viscus : cut off portions of it when tainted with gangrene, and amputate carious or fungous tumours arising from its substance.” “ Nor should it be forgotten,” (says the member of the Royal Academy), “ that we have proved, in a former essay, how well and safely openings may be made with the trepan to allow of these various operations.” What good such essays may do it will be difficult to say ; the danger of proving any such matters is very plain ; better by far leave such unprecedented operations to be done only from the urgency of desperate circumstances, than make them seem light and trivial by this familiar enumeration of contingencies, which I would almost pronounce imaginary, which, in the outset of life, and in the moment of reading such papers, occupy greatly the mind of the young surgeon, who yet grows old in practice, wondering that he has seen nothing of those abscesses requiring puncture, nor of those gangrenes and cancers of the brain.

There has ever appeared to me something reprehensible in the works of the French academy, so that I should shrink from the thoughts of putting these volumes into the hands of the young surgeon : throughout these papers, the academicians talk of numerous perforations with the trepan ! of sawing out large pieces of the skull ! of puncturing the dura

mater as freely with the lancet as you would puncture a vein ! of shaving off the protrusions too apt to take place after such incautious openings of the skull ! of the wasting of vast quantities of the brain by abscess, and of safely amputating part of its substance with the knife, in a tone of familiarity neither right nor becoming, and requiring the strong antidote of facts and reasoning, and authority, as there is much authority against such doings ;—the authority of men who in the ages less tolerant, and less enlightened, had the sense and courage to oppose similar doctrines, and refrain, even when the occasion and temptation were fair, of acquiring reputation without blame.

“ The young surgeon, seduced by such precepts, tempted with a likely occasion of acquiring fame, and fortified by the authority of a whole academy of surgeons, convened for the purpose of ascertaining the principles of our art, may rush into these desperate enterprises ; we should therefore guard him against such misconduct, by instilling early into his mind just principles and modest thoughts.” Could it be believed, that any man could make the insensibility of the brain (though proved and acknowledged), an argument for plunging the lancet, upon every suspicion of abscess, into its substance, or work himself up to such a fervor, or rather phrensy, as to speak thus familiarly of a few slight incisions into the substance of the brain ? It is in the next paragraph that Mr. Quesnoy speaks of the insensible nature of the brain* ; but the paragraph is so audacious, that, in

* Et si on ne découvre rien sous le crane ni sous les membranes du cerveau, on peut hasarder quelques petites incisions dans la substance même de ce viscère. Pour s'assurer s'il n'y a point dans la

place of translating it in my text, I transcribe it on my margin ; there let it stand, like a beacon on a foreign shore.

Next arose Mr. Pott, a surgeon of unrivalled excellence, whose influence was fairly acquired. But let those who have influence with their profession use it discreetly and wisely ; let them ponder well the maxims they announce ; for Pott fell into a system of practice so bloody and enterprising, that, in the few years which have elapsed from his death, it has fallen into utter discredit, and he delivered his maxims in a style so decisive and imperative, as to impose even now upon the younger part of the profession, while, by all who judge for themselves, his practice is abandoned * ; no wonder it is abandoned, being, in every point, except one, repugnant to good principles. He, in every case, whether slight or dangerous, cuts off the whole puffy tumour, scalping the part with a circular incision † ; he, in every sup-

substance corticale, et même au delà, quelqu'abcès qui soit la cause de ces accidens, une telle incision n'est point à redouter pour la vie du malade ; car si l'incision rencontre l'abcès, elle peut sauver la vie ; et si elle ne l'atteint pas, cet abcès fera perir le malade indépendamment de l'incision ; elle n'est pas à redouter non plus par rapport à la douleur, car on a souvent observe que la propre substance du cerveau est insensible.

* In the accounts which we have of the former practice in France, it is related that surgeons made numerous perforations along the whole track of a fracture of the cranium ; and, as far as I am able to judge, without any very clear design. Mr. Pott also advises such an operation, with a view to prevent the inflammation and suppuration of the dura mater, which he so much apprehended. But many cases have occurred of late, where, even in fractures with depression, the patients have done well without an operation.—*Abernethy's Essays*.

† It is no extenuation to say that Sharp did so before him : “ Et ex sloicis quidam medici sunt qui amputant Angulos vulneris et projiciunt ; et est illa intentio in qua non est nisi fatuitas.”—*Brunius Chirurgia Magna*, lib. 1. cap. 17.

puration of the dura mater, and in every case of extravasated blood, applies the largest trepan, though he has no other purpose than to give vent to such matter or blood. Dissatisfied (as he had reason to be) with the small trepans in common use, he ordered them to be forged for him of an unusual size, and did not spare their liberal application. After perforating the skull once, in place of providing by other means for the free evacuation of the matter, he applied his trepan again and again, till all the suppurated surface of the dura mater was displayed, declaring it to be his intention to cut away all that part of the skull, however extensive, under which the suppuration existed *.

“When the operation,” says Mr. Pott, “has been performed, not as a preventive, but to give discharge to matter, the only chance of relief is from laying bare a large portion of the dura mater, that the discharge may be as free, and the confinement as little as possible, as nothing but this can do good †.” And again he says, “Yet perforation is absolutely necessary, in seven cases out of ten of simple undepressed fracture of the skull.” He does by no means deliver these rules with temperance, but says, “I am as well satisfied of this as of any truth which repeated experience may have taught me ‡.”

At first, the reader would naturally say within himself, “Surely Mr. Pott, before he could use such confident language, must have seen repeated and afflicting proofs of the necessity of using the trepan;” but to his utter confusion, he finds the very words repeated in commending the now obsolete operation of scalp-

* Vide Pott, page 138.

† Page 178.

‡ Page 145.

ing, and, indeed, on every occasion, trivial or important, for it is with this author a manner, and no more : He says*, “The way of doing this (viz. of scalping) has formerly been the occasion of much difference of opinion ; but there can be no doubt about the greater propriety of removing a piece of scalp for this purpose, by an incision in a circular form !” Even when Mr. Pott applied the trepan, not on account of any present, but of some eventual, perhaps imaginary danger, he set no limits to the number of perforations, but the extent of the fracture. He says †, “If the trepan be applied in a preventive sense merely, the length of the fracture must determine the number ! one or two only may be made at first.” In short, all his precepts, most of his cases, and even the very form and size of his instruments, contributed to renew and strengthen that passion for frequent perforations and large openings of the cranium, which the decline of false learning and the progress of plain good sense had almost allayed ; and I will venture to say, that whoever has studied his writings, or imbibed his principles, must imagine, that, in the work of trepanning, he can never do too much, and is only blamable where he has left any possible thing undone.

Unfortunately this passion for leaving nothing imperfect in a difficult and dangerous operation, nothing that might endanger the surgeon’s reputation or his patient’s safety, is not a learned maxim, but a most natural propensity, one which has prevailed in all ages, requires all our discretion, and should be kept under due restraint. That every the slightest de-

* Page 169.

† Page 177.

pression should be trepanned, is a notion which gradually and insensibly insinuates itself into the mind of the young surgeon, who says within himself, "If soft and fluid blood oppress the brain so dangerously as to require perforation of the skull, how much more deep and deadly must that oppression be which proceeds from a hard and firm bone depressed and driven inwards upon the brain, and so immoveably fixed that it cannot be raised : surely it should be cut out with the trepan ? If the trepan be at all useful, to be entirely so, the operation must surely be complete ? If there be danger from depression of the skull, or from blood or matter being confined under it, surely every depression, even the slightest, should be raised, nor must large openings be spared, seeing they are necessary to give free vent to the matter or blood ?"

This, I believe, is but giving words to a prejudice, which, though not avowed, is yet universally felt : such prejudice arises from inexperience and fear ; nothing indeed but fear and ignorance could make a man think it his duty to raise every slight depression, or believe it a fatal error to leave the slightest imperfection in that part of the work. The passion for raising depressed bone, for obliterating even those slight dimples, of which the skulls of children are so susceptible, gave occasion to the most puerile and ludicrous inventions ; the project of discovering fractures by making the patient crack walnuts, or hold a wire in his teeth, are not more ludicrous ; and we feel mortified to observe even the sagacious and sober Hildanus occupied as fervently as the greatest fool among those inventors, in laying down various rules and methods for elevating depression in boys, or in men, according to their various ages. To prove that

we never should be at a loss for instruments to perform so laudable a work with, he relates the case of a country fellow, who, being wounded in the head with a halbert, fell down as if dead; a surgeon of respectable skill being called to his assistance, found him seemingly apoplectic, and liker death than life: having no elevator nor any suitable instruments at hand, he procured "a carpenter's gimblet, screwed it into the chink betwixt the two fractured bones, raised them to the level by the hold it gave him, and extracted several splinters of bone *."

It had been well if Hildanus had confined himself to the eulogium of a resource, in some degree sensible and necessary. Wurtzius desires all such dinges and impressions to be left alone; saying, "*Circa impressum cranium non multum laborandum;*" how much, on the contrary, Hildanus toiled in this occupation, you may judge from this, that he invented various plasters, which, being laid upon the head of the child with a string in the centre, operated like a boy's sucker fastened to a stone; by pulling the string, you raised the depression; and Hildanus adds this special direction, that, in place of altogether shaving the hair, you should only cut it close, that the plaster might stick to the roots. Next, he invented a sucking-horn, which he has very carefully delineated, which, being applied like a cupping-glass, and sucked by a man of strong breath, raised the depression! and, finally, he directed that the child should strain its

* Hildanus himself assisted at this operation, and assigns his reason for transcribing it as a precedent. "*Hæc propterea adscribo, ne fidelis ac diligens chirurgus ægrum periclitantem, propter penuriam instrumentorum relinquat.*"—p. 83.

own breath, or that if it would not or could not do so, you should close its mouth and nostrils, and hold in its breath, to assist the external suction. Thus did he suck out the dinges and depressions from the skulls of boys ; but to maintain the bone on its due level, after being thus raised, he fell upon a more profound invention, more applicable to depressions in men, whose bones are firm : “ A depression of the skull, though elevated to the level, is, according to Hildanus, apt to fall down again ;” to prevent this, he invented a shorter screw with two holes in it, and fixing this screw in the depressed portion, he pulled it up, and put a pin through one of the holes in the screw, to prevent its falling down again, and there left it. “ And mind,” says Hildanus, “ to have a file at hand to file off the end of this cross bar if it should prove incommodiously long.”

Having marked out, as worthy of your particular observation, certain points, in which sense and learning will ever be at variance, I proceed to teach you a sober line of practice. I could have no pleasure in frequent allusions to past errors, unless they had an immediate relation to modern practice. Enterprising operations are in vogue, chiefly because such doings are spoken of with commendation, and recorded among the wonders of surgery. While the old surgeons allowed not the slightest chink, fissure, or rima, as they called it, to escape investigation ; the slightest fissure, or the bare suspicion of one, was the signal for applying the trepan, and there was nothing so gratifying to them as a fracture so circumstanced, or an extravasation so extensive as to require, or at least to vindicate, the application of

the trepan ten or twelve times. It was not that the crown of their instrument was small, and thence its application necessarily frequent, to make even a moderate opening; they scrupled not, after making numerous perforations, to cut up all the intermediate pieces of bone with the saw, and clear away a whole parietal bone, or half the skull. This was the pomp and pride of surgery in former times, which you are called upon to imitate, by the approbation with which such facts are now commemorated, and by the very form of instruments put into your hands, which are by no means calculated to make very moderate openings; the making very large openings, either by large trepans or frequent perforations, is a practice highly commended in every book, and the extent of the fracture is usually reckoned the sole limits of the opening.

“In extensive fractures,” says Dionis, “we should not hesitate to make two, three, or four perforations, if required. A young girl, of eleven or twelve years of age, having, by a fall down stairs, fractured the whole of the parietal with a part of the temporal bone, Mr. Marechal trepanned her next day in two places; he made his son trepan her a third time; he allowed my son, who was present, to trepan her a fourth time; he, next day, applied the trepan twice more, and in the end had actually perforated twelve times, and cured her completely. So precious an example shows how little reason we have to be surprised at the frequent application of the trepan.” Here is a doctrine laid down which, I fear, there is little occasion to enforce; and I cannot but persist in being surprised and shocked, at the frequent and large perforations which I have both read of and seen, and

cannot but think of these veterans in surgery in no very amiable light, when I see them indulging their boys in the novelty of operating, probably on very slight compulsion.

These reports, and especially the last clause of this paragraph, viz. "that we should not be surprised at the number of trepans," have plainly a reference to the ever memorable operation performed in the time of King William's wars on Philip Count of Nassau, by Henry Chadborn, chirurgion. Godifredus, chief surgeon to the States of Holland, mentions with particular exultation this operation performed by his friend, who trepanned the cranium of the Count of Nassau twenty-seven times, and ascertained the fact by the most indisputable authority, for he made the said Duke of Nassau, after he was recovered, on the 12th day of August, 1664, write the following curious certificate: "I, the under written Philip Count Nassau, hereby declare and testify that Mr. Henry Chadborn did trepan me in the skull twenty-seven times, and after that did cure me well and soundly."

We find that it had been the practice of the older surgeons not only to apply their trepans the whole length of a longitudinal fracture, but along each of the radii of a star-like fracture, and in short, to repeat the expression of Platner, "to cut it out." The testimonies of the most sensible writers are against the operation, and most unfavourable to the men who have indulged it, for it has been ascribed not to reason but to pride. "If the opening," says Wiseman, "in the fractured skull be not sufficient, make one in the most declining part, and raise up the bones, and free the membrane of whatever may offend it, but do not take out any more bone than needs must, like some

of those surgeons I have met carrying them about in their pockets, boasting in that which was their shame."

"I have seen surgeons," says Ravaton, "so infatuated, so desperately bent on discovering abscess on the dura mater, that, after applying six crowns of the trepan, they would, I very believe, have pulled away all the remaining bones of the cranium, had not their patients been delivered by death from such operations*." In short, their doctrines and practice outraged common sense; every thing was to be done by the surgeon, nothing left to nature; every depression was to be elevated; the whole matter to be evacuated; the whole extent of the extravasation to be covered by trepan holes, and the limbs and whole extent of a radiated fracture were to be cut away. There were no limits assigned for these openings, but the extent of the extravasation or fracture, and they were well contented to find that forty crowns of the trepan might upon necessity be applied to the human skull!

But there is a scene of practice very different from this, where men, engaged in the actual duties of the profession, in peace or in war, in cities or in the field,

* A combien des chirurgiens qui sont d'ailleurs fort habiles, mais qui ignorent ces connoissances; n'est il pas arrivé de se meprendre, et d'appliquer le trepan trop tard ou sans nécessité. J'en ai vû de si obstinés a chercher un dépôt, qu'après avoir appliqué six couronnes sans rien recontrer, ils eussent, je crois enlevé le resté des os du crane, si la mort ne leur avoit enlevé leur patient.

Mais quand le dépôt qu'ils cherchoient auroit été recontré et enlevé, comme s'il n'y en avoit jamais eu; la raison et l'expérience de tous les tems, ne montrent elles pas, que la multiplicité de ces sortes de playes doit être mortelle, que la regeneration de la peau que vous coupez ne peut jamais se faire. Je passe sous silence le premières accidens, qu'occasionent toujours la lezion du pericrâne; les os mis a nud, bien ruginés, &c.

learn to look coolly on wounds of every description, and know from experience what nature will do, and how impertinent and vain those operations are. It often happens to grooms or farriers, trimming horses' feet with too little precaution, that the horse striking out, they receive the kick full in the forehead; the scalp is torn up, the skull manifestly injured or not a little depressed; these men live a coarse irregular life, and yet such fractures heal easily; but were the trepan applied on every such occasion, we should have many dismal scenes. It often happens that boys playing with horses, plucking hairs from a colt's tail, for example, are knocked down by a kick in the forehead; often the bone is deeply depressed, very often the marks of the heels or caukers of the shoe are impressed upon the *os frontis*; sometimes a piece of the bone is actually turned upwards along with the scalp; but the scalp being reapplied to the skull, the splinters of the bone picked away, and the ragged integuments smoothed and brought together, the boy, without one hour of sickness, recovers as if his wound were only of the skin. But were such pieces of depressed or shattered bone cut out; were openings made at all proportioned to the depressions or to the extent of the fractures; were the delicate *dura mater* of a boy left exposed to that force of circulation, which dilates the brain, and fretted by every stroke of the arteries against the margins of the opening, the *dura mater* would slough, the brain protrude and suppurate, and the boy expire convulsed. Examples of such imprudence and such consequence I shall presently relate, for I know, that when my business is to impress you with any practical truth, the best

way of confirming the maxim and making you feel the force of it, is plainly to represent the scene*.

Often the recovery where the skull is very deeply wounded is so rapid, as to surprise those even who are the most resolute in refraining from the use of the trepan, and the best prepared to expect a happy issue. The faith and credit of Pareus stand unimpeached; and the case he relates, of a cure performed with his own hand, is the most remarkable of any yet recorded; since even the segment of the skull itself, in a clean sabre-wound, adhered again in common with the wounded scalp. "I advise," says Pareus, "wherever there remains a portion of the skin still connected with the wounded scalp, that neither that skin nor the divided portion of bone be cut away, but the bone sewed up along with the skin. What Celsus commends (says Pareus), I performed in the case of Captain Hydron, who was a short while ago wounded in this city with a sword through the centre of the os frontis, the bone being cut down the length of three inches, so that it hung over his face, connected with the skull only by its pericranium, and about three inches of the fleshy scalp. At first sight, I questioned whether or not I should complete the separation of this piece of skin with its adhering bone, but remembering Hippocrates's maxim never

* Two cases of this kind are now under me. One of the boys was struck in the forehead; the bone above the right eye was shattered; I picked away the broken bones without the necessity of using the trepan. The dura mater was exposed, but it is granulating, and the wound is healing. In the other, the horse's shoe smashed the bone, and forced the pieces into the brain; the trepan was used; the pieces of bone taken away; indeed a portion of the brain lay upon the wound. Fungus begins to project, and he must die; but if, in such boys, there had been only a depression, without an abrupt fracture, I should have been contented with avoiding inflammation.—C. B.

to uncover the brain, I cleansed the blood, which was upon the dura mater, laid up the separated piece, and, for the better retention thereof, made three points of the needle in the upper part, and put in three small dossils in the sides of the wound, the whole being so nicely replaced, that, by God's grace, it healed perfectly, though the gentleman was otherwise much wounded on the face, in the thigh, and in the right breast. I finally beseech you (says Pareus) never to amputate neither skin nor bone, lest the brain should be left bare."

In the work of Berengarius, *De Fracturis Cranii*, so much and justly praised, you have no instructions for discovering, nor any warrant for trepanning fissures. He seems to have been taught a very different practice by his father in his earliest years. They seem, in these times, always to have felt a sort of trepidation when they sewed the scalp; and Berengarius gives many anxious directions about undoing the stitches upon the slightest appearance of fever or abscess; but still he directs that the scalp be sewed.

Especially when the bone was wounded, they feared to sew the integuments; yet Berengarius, while he complies with the rule, relates an exception highly worthy of notice. He reminds his reader that he had advised the suture of the scalp only when the bone was unhurt and the pericranium entire; "for a suture," says Berengarius, "being drawn close over a diseased bone, the patient dies, wherefore, such wound must be dilated and opened, not sewed and closed. Yet, I call God to witness the truth of the following narrative, so unprecedented that I dare hardly tell what I saw. While I was a young man,

a soldier wounded his fellow with a weapon, and cut down the *os frontis* from its upper part to the superciliary ridge, so that the *os frontis*, with its integuments, hung over his eyes, divided from above and at the sides, and connected only below. My father went first to his assistance, and removed the bone from the integuments; the bone was the whole length of the *os frontis*; the *dura mater* was untouched. The skin of the forehead was replaced and stitched without that opening at the lower part of the wound which surgeons are accustomed to leave as a drain for the matter; being closed with white of eggs, and dressed daily, it was in ten days completely reunited, and ever after the systole and diastole of the arteries were distinctly seen where the bone was wanting. This I have put down, says Berengarius, to make medical men keen and courageous in curing wounds."

Besides these instances in domestic life, it is remarked, to the dishonour of our trade, that in times of war and trouble, when men are not allowed to take care of their wounds, those who are least cared for are soonest cured; and a man, who is forced to wrap a clout about his head and ride for his life, is safer than one who is chambered up, dieted, and dressed, perhaps trepanned by the surgeon. The great rebellion was full of such adventures and hair-breadth escapes, many of which are related by Wiseman: among others, that of "a gentleman who, a day or two before the battle of Worcester, attending the Earl of Derby in his retreat thither, received a large wound between the sagittal and coronal sutures by a sword, which went through the cranium to the *dura mater*," is exceedingly remarkable: "the membrane was covered with small shivers of bones: he had only a thin linen cap over it, his haste not per-

mitting him to be dressed, and, it may be, it was the better for him, for if dossils had been hastily crowded upon the bones, severe symptoms would have followed; whereas the shivers lying lightly upon the membrane, he was free; and being ignorant of his danger, rid a great journey: I after took them out, and dressed the membrane with digestives, the short time we were together." It was upon such proofs that Wiseman came to be persuaded of this general truth, that "recent fractures of the cranium do frequently unite like those in other parts, if the matter hath liberty to discharge from within. Therefore having raised up the bones that are loose, dress the others dry*."

You will not easily find a more dramatic representation of such a wound, nor a more artless narrative of a cure, than that of the soldier wounded at the fight at Worcester. "At the battle of Worcester, a soldier came to us where we were dressing, with his sword in his hand, the blade broken off near the hilt, with many wounds on his head. I, seeing the hairy scalp of one side of his head hanging down his neck, went to him; and calling my friend Will. Clarke to me with a sponge to cleanse the wound, we saw six pieces of the skull sticking on it: some of them were of the first table, others of both tables. Besides which, there were various fissures, *sedes*, and some fractures, with depression, made by sword, musket-stock, &c. We freed the scalp of those bones, and returned it upward so far as we judged it necessary; then cutting off what was superfluous, tacked it to the sound parts by several stitches distant from one another, leaving a space to dress the de-

* Wiseman, p. 113, vol. ii.

pression and greater fractures. Then we dressed up the wounds with digestives *ex terebinth*, &c. and where the dura mater lay bare, we applied pledgets dipt in *ol. ros.* and to the other parts of the cranium, *liniment. arcei*. The alarm growing hot of the enemies entering the city, I left Will. Clarke to bind it up, and made my way out of the town. But this young chirurgeon, being taken busied in dressing the wounded soldiers, had liberty, after the heat of the fight was over, to employ his charity in dressing some of them, and writ me since this soldier's particular case: viz. The third day he found him pretty hearty, and his wounds mattering so very much, that he was necessitated to cut loose two of the stitches, to give vent to it: then he dressed the penetrating wounds with *mel. ros.* and the cranium with lint pressed out of *spir. vini*; and proceeding accordingly in the cure, saw the depressed and mangled bones cast off, incarn, and cicatrize with the rest. The soldier, being thus cured by him, made a voyage to the Indies, and since had served as a soldier in the Tower of London.

“During the war (says Wiseman) I was frequently employed in the dressing of some one person or other, wherein I have seen all or most of the several sorts of fractures. I have dressed many that have been cut through the skull, the shivers of the bone lying pashed with the flesh and the hair, upon the dura mater; yet the patient hath had no symptom of such a wound.” Here, in a few sterling words, are descriptions which will better satisfy all your doubts than the most learned arguments.

So much for open wounds, when the clean incision of a weapon seems to have done the business of the

trepan. But, even in cases where the bone is fractured with a wide and portentous fracture, or when it is actually depressed in a way which might vindicate the application of the trepan; in cases where it requires some courage to refrain from operating, the patient is cured with surprising ease. I can be at no loss in proving this; if I could feel any difficulty, it must be only in selecting the cases which best represent the variety of circumstances. Mr. O'Halaran, who practised in Dublin, the metropolis of broken heads, might very naturally feel himself engaged to write on fractures of the skull. In his paper in the *Irish Transactions*, we find, among other cases, that of Edward Power, "who received a desperate wound of a back-sword, extending from the top of the coronal bone to the orbit of the left side, forming an extended and frightful chasm, in which were included the bone, membranes, and brain. It bled considerably, as well may be supposed. He remained exposed to the air for near three hours after, and had not so much as a bit of rag to cover it. Fever and inflammation of the brain might reasonably be apprehended; yet, by a couple of bleedings, and some other antiphlogistics, the man was completely cured in five weeks, without exfoliation or the smallest operation."

On one point you may naturally feel some hesitation. You see that clean wounds, as when a trooper is cut to the skull with a sabre, are not (even when the skull is fractured, or part of it sliced away), attended with that danger which was once supposed; but fracture of the skull produced by a heavy blow, where the bones are broken, perhaps depressed, may be, nay must be, an injury of quite a different nature.

You are not only to refrain from trepanning fissures, in the absence of dangerous symptoms, but, if I may advise you, even fractures very wide and gaping. "John Smith," says Mr. Hill in his Book of Cases, "when forty years of age, had several inches of the scalp torn off by the kick of a horse, and some of the hair was beaten inwards through a long fracture of the skull, which was so wide that there was no occasion for the trepan. He recovered in a few weeks, and is well." Why does Mr. Hill announce this fact in such abrupt familiar terms, but because he well knew that this was no unusual accident, that he had often seen such fractures of the skull spontaneously cured.

Even deep depressions and very irregular fractures heal, and, what is more rarely to be found, are permitted sometimes to heal, undisturbed. The case of James M'Cartney, a boy of between five and six years of age, is of this nature: "He had a large piece of the parietal bone driven deep in by a stone. A few days after he was stupid, dosing, starting, and vomiting. There was a large tumor and obscure fluctuation on the depression, owing to some ounces of blood below the pericranium; on piercing of which, it sprung out to about a foot's distance. The incision was continued across the depression and fissures: to prevent such exfoliations as often happen, the scalp was instantly laid close down again, with soft dossils only in the wound to keep it open. As no bad symptoms intervened, the fissures being wide enough to allow a passage from within the skull, nothing farther was done but lessening the dossils gradually, till it healed, which happened in a short time, without exfoliation. The hollow is consider-

able, and will continue for life*.” He is in good health, and at sea.

You will naturally say, What then should we infer from these cases? Are we to do nothing in fractures of the skull? Are the instruments hitherto appropriated to fractures of the skull to be thrown aside? The trepan is not the instrument appropriated to fractures of the skull, but that with which we perforate the bone, when either fracture or any other kind of occasion requires such opening; and of all the motives for using it, that of fracture of the skull is the least frequent. You perforate the skull to let out extravasated blood which oppresses the brain, to open abscesses which could never force their way through such resistance, to raise depression, but never on account merely of fracture. Allow yourselves but to consider in what fracture of the skull differs from that of any other bone; not in want of circulation in the skull! You have every proof that its circulation is lively and perfect, since the dura mater is detached, the pericranium scraped off, the bone itself bent from its right direction, sometimes raised up, sometimes depressed*, and yet it does not die: you see the integuments coarsely torn off with a stone or a carriage wheel; you see the skull rough, yellow, and apparently void of circulation; you see every threatening appearance of caries, and would believe it dead. Often the wound seems as if a part or the whole would exfoliate, yet in a few days all the naked part of the bone begins to look red; a fine velvet like down of vivid granulations begins to appear in spots and clouds upon the bone;

* Hill's Cases, p. 117.

sometimes these granulations are, out of mere wantonness and ignorance, scraped off, but they instantly sprout out again : what becomes of the rima fissure, or fracture, is never observed ; it is covered in by this pile of granulation spreading slowly over the bone, and uniting it with the integuments. This process I have seen with admiration, where I could least expect it to take place ; in old creatures of ninety years of age, very poor and miserable, and in whom, along with fracture, the integuments had been so mangled as to slough off in flakes. It is just such a delicate pile of granulations that covers the surface of the dura mater, when it appears after the operation through the trepan hole, uniting the dura mater with the integuments and with the margins of the perforation.

The motives assigned for making large and frequent openings are, in case of simple fracture, to prevent danger ; in case of depressed fracture, to raise up the depression ; in case of extravasation or abscess, to let out the blood and matter freely. But, are not the smallest openings we can make sufficient to give vent to any suppuration, as the smallest puncture is sufficient for the cure of the largest abscess in any other part ? Is it possible, would it be prudent in any case to lay open all that part of the skull under which blood is effused ? Though you were to work with your trepan as industriously and unconcernedly as a button-maker, or to trepan as this Henry Chadborn did twenty-seven times, you still would never get to the end of your operation, if the extent of the extravasation were its only limits : I have rarely seen a case of extravasation where the cake of blood did not extend over one entire hemi-

sphere! under a whole parietal bone, and generally down to the basis of the skull, nor an abscess but where much of the surface of the dura mater was coated with pus: I have never had the good fortune to perform or assist at any operation in which it was possible, had we been so extravagant as to design it, to expose the whole coagulum of blood by perforations. In short, what I have observed is this; that, where, in the case of abscess, we are fortunate enough to be alarmed early, one perforation gives vent to the pus as well to my apprehension as fifty. The matter bubbles out at each systaltic motion or heaving of the brain; nothing prevents it but that fungus or protrusion of the brain, which so frequently happens when the openings are large, that I may almost assure you that, where the openings are made large, they never continue long free, but are plugged up by protrusion of the brain. In the case of extravasation, which has no certain limits, I have always been sensible of the folly of trying to lay it all open, for then the limits of our operation could only be the limits of the skull; but after one perforation, when, by the heaving of the brain, the clots have rolled out of the trepan hole, as thick and black as pitch, there succeeds a more fluid blood, the patient often finds instant relief, moves his paralytic side, raises his eyes, and though without being able to speak, knows his friends; from day to day, the blood by the natural process of its dissolution, and by a sort of secretion from the surface of the dura mater, is diluted and flows out. The introduction of the probe, in every direction, proves how vain it were to attempt laying open the whole extravasation. The deep introduction of the probe has probably suggested that

practice, which is mentioned in books, of making a second and far distant perforation as a counter-opening, but which I cannot approve, because I have never seen it necessary. The probe bent and surrounded with a little lint is very useful in hooking out the clots, and an injection of tepid milk washes them away. While the coagulum is thus resolving, the dura mater is suppurating and cleansing on its surface; it is at last seen through the trepan hole of a lively red, granulating and bleeding upon the slightest touch: then it comes into close contact with the lower surface of the skull, protrudes with a gentle convexity through the trepan hole: the granulations of the integuments, skull, and dura mater gradually adhere, till the whole becomes one undistinguished granulated surface, where bone cannot be distinguished from flesh. This is the state of matters (with occasional interruptions and variations) in the third week, and thus the opening closes and heals. I have found it necessary, from the strong protrusion of the dura mater into the trepan circle, if not through it, to repress the dura mater at each dressing with the probe wrapt in lint, in order to give exit to the matter or blood.

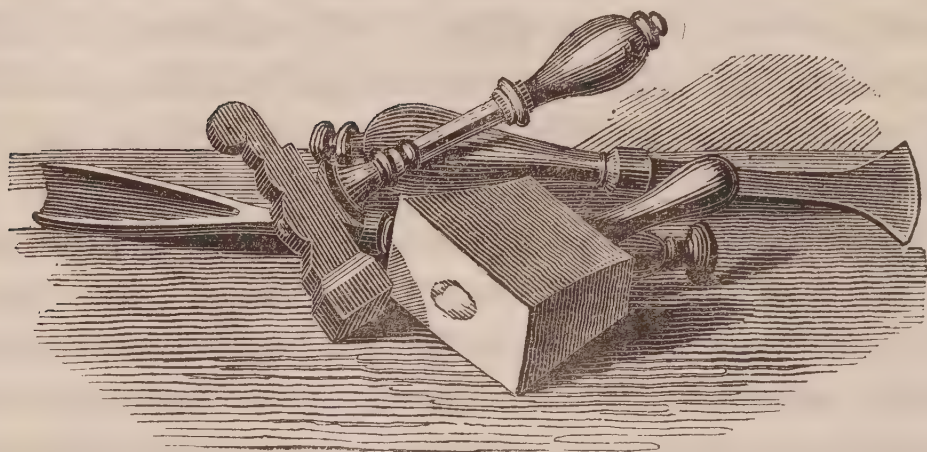
This I can most safely affirm, that wherever I have seen cases of fracture, whether simple or depressed, committed not injudiciously nor carelessly to nature, they have very often done well. Wherever I have found the surgeon impatient to perforate, intent on raising every depressed part of the skull, careful to include in the circle of his saw every suspected piece of bone, and anxious to secure a free evacuation of matter by large openings; I have seen such tearing up of the skull, especially in boys, as I

could not witness without pain, uniformly followed by protrusions of the brain and death. In no other part of the body do you open abscess or discharge extravasated blood by large openings; is the brain the only part to be thus roughly treated and exposed to the air, to dressings, and to every thing that is supposed to injure it?

Are we then to do nothing in fracture of the skull?—Nothing, I believe, which you should not do in fracture of any other bone of the body*. Pick away the fragments of bone, lay the edges of the lacerated scalp smoothly together, lay all nice and close, dressing the wound daily and lightly that it may adhere, which often it does to a miracle, the dura mater, trepanned circle, and crushed bones and integuments, all consolidated in one firm scar: preserve the patient carefully from every irregularity or excess that might cause inflammation; keeping him quiet, cool, low in diet, and with cold lotion on his head. Bleed him if it be necessary (and always let the scalp bleed freely), and subdue the action of the arteries by doses of tartar emetic. Be

* “In fractures of this bone, when you have made way for the relief of the brain, and reduced the broken parts into their places, such of them particularly as are not entirely separate, you are to take care that no more of the said fractured cranium be removed than necessity calls for; at leastwise, any large portion thereof, by which the membranes, and sometimes the brain itself, may be exposed, at least, the cure protracted. For since we see daily that other bones, divided in like manner, are united by mediation of a callus, nature is as little wanting here, from the broken edges, together with the diploe or narrow interstice, to provide a cement for their coalition, more especially in those we call wounds of the cranium, where large pieces are sometimes divided by a sword or scimiter in close engagements, and have been left adhering to the pericranium and scalp, which, being replaced, and the external wound stitched up, have often been found united as other compound fractures.”—TURNER, p. 217.

assured that the experience of a Wiseman and the good sense of Platner are not to be despised: remember what Platner affirms, "*Si nulla mala indicia sunt, modiolus usus supervacuum est.*" Adhere to this general maxim announced from such high authority, and it shall be my care to explain every exception so fully as to prevent you, while you avoid the fault of hurry and impatience, running into any fatal error from neglect. You see with what perfect confidence these celebrated men dressed up a fracture, and committed the case to nature, while men of less experience or knowledge would have been busily occupied in scraping every limb of the fracture, and in applying the trepan to each. But they were emboldened by the best of all teachers, experience, to act thus; and whatever prejudices in favour of operation you may carry with you from the school, to this opinion must you return at last. I can safely declare along with O'Halloran that, "in cases of fractures of the skull, long experience has convinced me that many of them require no operation." If there be any exceptions to this rule, it must be when the fracture is accompanied with depression.



DISCOURSE V.

ON FRACTURES OF THE SKULL WITH DEPRESSION.

I MUST seem then to have admitted that “depression of the skull oppresses the brain, and requires to be raised up with lever, or cut out with the trephine:” yet there is no general conclusion I should more unwillingly allow; I should be inclined rather to reject the general rule than qualify it with so many perplexing exceptions as it would in my judgment require. There are many depressions so fixed that no force of instruments could raise them; so extensive, that to cut them out, or loosen and pull away each fragment of bone, would be to open half the cranium, and expose the brain to protrusion, on account of imaginary dangers. Depressions seem many times so alarming to the surgeon, that to raise them, or cut them out, he will use the most unjustifiable violence: yet, though he fails, and the depression remains, the patient, notwithstanding this additional violence, survives: and many times the de-

pression, which has been the subject of such unjustifiable violence, though very conspicuous while the surgeon is labouring to raise it, is really so slight as to vanish even before the wound is closed.

The striving to elevate depressions of the skull, while the patient, far from having any oppression of the brain, is crying with torture, struggling and resisting, though it has been long esteemed the most meritorious work in surgery, is extremely censurable, and has, to my certain conviction, brought many a patient to an untimely grave. “I shall now (says O’Haloran) remark on such fractures as necessarily require the operation in the first instance: these are fractures accompanied with depression, with or without wounds: for, not to advert to the restraint such pressure must necessarily cause to the motion of the brain, sufficient in itself to produce fatal effects,” &c. This is affirming, in its utmost latitude, that very mistake on which all the bloody doings of past and present ages are to be attributed. “If a single operation (says Warner) be insufficient (as I have often known it to be) to effect the elevation of the depressed bone, a second and a third must be performed, that the surgeon may be enabled to raise up every part of the depressed bone; which rule must be strictly observed, otherwise the operation cannot be expected to be attended with success, as the bad effects of the oppressed brain must remain.” In every elementary book you read the same language, and from every lecturer hear the same general conclusion; for, in describing the skull, he assigns depression of it and its fractured part intruding upon the brain, as the principal occasion for using the trepan.

This passion for leaving nothing undone will na-

turally glide into your minds ; for the prejudice of every profession is in favour of what its art can accomplish, and in ours this bias is peculiarly strong : trepanning fractures, raising depressions, and making ample openings for blood or matter, are the surgeon's chief pride. But I cannot help recollecting the droll expression of Permannus, who says, or his translator for him, " There are many persons who fondly imagine that boring a hole in the skull is an easy matter, and to be done at any time, whereas it requires mature consideration, a very able head, and a skilful hand to undertake it *."

Aware of the deceptions to which you are exposed, I should feel myself much to blame did I neglect to warn you of them. You will say within yourselves, " Though it is plainly our duty, and is most natural, to leave a mere incision or wound, although it affect the skull itself, untouched and but lightly dressed, since we know that wounded bone will reunite with the soft scalp ; though it be equally natural and right to treat a compound fracture of the cranium, even where it is much shattered, like a compound fracture of a limb, by picking away the loose bones, cleansing the wound, composing the soft parts, and laying all smooth and close ; is it equally natural or proper to leave unreduced a depressed portion of the cranium, which cannot but press upon the brain ?" " Surely," you would say, " the visible depression of a piece of the skull must be an oppression to the sensorium, of the worst and most dangerous nature, because it is sudden or rather instantaneous, and because it is produced by a firm and solid body : blood and matter being fluid, may be absorbed, and thus time may

lessen that kind of pressure ; but what can remove the compression of a firm and solid bone ? Are we to remain," you would be inclined to ask, "unconcerned spectators, whilst our patient labours under a visible depression of the cranium?"—These are real difficulties, and must be answered ; and facts will hardly persuade you when balanced against such strong probabilities : but the whole question shall be fairly laid before you ; it is one of those which I stand pledged to discuss with soberness and deliberation ; it is one in which you must learn to decide on sure principles, since you are about to enter on that scene where responsibility rests on each of you, where you must trust to your natural reason, not to the dogmas of any teacher, and suit your practice to the various exigencies of each case.

There is a wide difference, in theory and in fact, betwixt the oppression proceeding from extravasated blood, and that from depressed bone. It is because bone is firm and immoveable that its depression does no harm ! for the pressure it causes is permanent, not progressive ; it is fixed and complete at once : if the patient be not struck insensible the moment the bone is beaten below its level, he never can become so ; and you will find, by a singular variety of proofs, which I am now to lay before you, that he seldom becomes insensible, unless by the process of inflammation and effusion consequent upon the injury. The brain is capable of accommodating itself to any degree of pressure which is fixed and stationary, and that arising from a depression of the skull is so slight that it can hardly be estimated ; for the depressed portion is a very small segment of a large circle : the broadest depression possible is not equal

to one-tenth of the whole convexity of the cranium. The smallest deviation from a circle seems very great, and that depression which is very visible outwardly makes no sensible impression within : the depressed portion of the cranium is so little off its level, that it merely exposes a rough and rising edge, never exceeding the whole thickness of the bone. The fractured and depressed portion dips only at the line of fracture, and declines very gradually from the line where it is level with the skull to the line of its greatest depression : a depression even of three inches long, of the parietal bone, for example, declining gradually for two inches, and terminating in a depression of the depth of a fifth of an inch (i. e. the full thickness of the most substantial skull), must produce an abridgment of its cavity inconceivably small.

The slight effect that could, in the worst depressions, be produced by intrusion of the bone, would be to exclude from the regular circulation within the head a very trivial proportion of blood. It is, on the contrary, because blood is fluid that its pressure is irresistible : the effusion is not instantaneous but slow ; every time the brain subsides, i. e. at each respiration, more blood exudes from the ruptured vessels ; it is injected betwixt the skull and dura mater by the force of the circulation : this internal hæmorrhagy is probably not complete at first, but is renewed in paroxysms ; it is not limited to one spot, but is diffused over the whole hemisphere of the brain : the extravasated blood has, by accumulating and coagulating, all the effect of a solid body ; nay more, as it increases in quantity, in proportion as the brain yields, it acts with the force of a wedge,

which presses harder the deeper it is driven. Such is the difference betwixt the injection of soft blood within the firm cranium and depression of the skull.

But these are only arguments, which you dare not trust to ; you must have proofs more relevant than this ; and the facts I have to display are really singular. It having once become an acknowledged maxim, that the surgeon should trepan every fracture and elevate every slight depression, no one having any opportunity of seeing a pure case of depression where the surgeon had not been busy, it might eventually have been very difficult to prove that it is safe to leave such fracture untouched. But a thousand favourable accidents have betrayed the iniquities of this rash practice, and proved, in various ways, that the surgeon has been usually occupied, and often with extreme violence, in elevating fractures which had been better left alone : sometimes, in the hurry and confusion of such a bloody scene, a remarkable depression of the skull has escaped investigation, the patient has escaped the violence and dangers of an operation, and the surgeon has been sensible of the deep depression only by feeling it through the scalp when the man was well : sometimes relations and friends have interposed and prevented the well-intended operations of the surgeon, who has protested against leaving a great depression unreduced, and prognosticated death, yet the patient has recovered : sometimes, the surgeon having leave to do his work, having made his perforations and pushed in his levers, has found the depression too deep and too firm to be raised ; after every justifiable and every unjustifiable violence, he has been unable to raise the depression, and has not dared to cut it out ; he has

left the patient in this desperate state, and yet seen him recover after such violence, added to the deep depression: sometimes when, from the foul air of hospitals, or the prevalence of epidemic diseases, the surgeon has been deterred from his favourite work, he has discovered, with equal pleasure and surprise, that “more recover (to use the words of Perusinus) by medicines than by the knife and the saw.” Indeed, the conclusion against the profession and its general propensity to operate, in mere injuries of the skull, is stronger than I believe you are aware. I know that if you had seen along with me the precipitation and violence with which depressions of the skull are torn up, and the miserable consequences arising from large openings, both your reason and your feelings would revolt against the practice.

“I chanced once,” says Platner*, “to be called to the assistance of one who had fallen from the third story of a house, and lay quite torpid and oppressed as in a deep sleep. The surgeon, having shaved his head, found there a very deep and wide depression of the skull. While we were wondering how the skull could be thus deeply impressed by the fall, the integuments being but slightly ruffled, the man recovered his senses in a fortunate hour; alarmed at the proposal of an operation, he told us that the impression we had observed was of no importance; he had it from his childhood; and yet had lived in perfect health: he recovered without assistance.” We are at a loss to conceive how, even where the integuments remain entire, so wide a fracture and so much depressed can be consolidated without any ill

symptoms; but several cases which I have myself witnessed make the process quite familiar to me: and one related by Botallus I think particularly worthy of your notice: "Some," says Botallus, "will very readily acknowledge that bones, fractured without an external wound, are easily cured in other parts of the body, while they deny the bones of the skull to be thus cured: I will relate plainly what I have myself seen. While I practised surgery, a boy, as I guess about seven years of age, fell from a gallery twelve feet high, and pitched directly upon his head. The parietal and part of the frontal bones were so fractured that you could feel distinctly the several fractured pieces, yet the skin (he having fallen upon a flat pavement) was not wounded, nor even the hair ruffled. When called, I was altogether confounded at finding such a fracture, the boy speaking and in his perfect senses, with only a slight acceleration of pulse (he was however insensible at first, and had vomited up his dinner along with some bile): a thousand thoughts passed across my mind, while those I had sent to the apothecary's were returning with some medicines. I was for some time irresolute whether to make an incision and pick away the fractured bones, or to leave the parts entire: at last I resolved on this more lenient plan. In place of making an incision, I covered the whole head with Armenian Bole, Myrtle Berries, and Rose Leaves, mixed with vinegar and white of eggs; and this astringent application I used during four days. The boy perfectly recovered without incision; he lived many years; and, though I do not recollect his name, I have reason to believe he is still alive*."

This ingenuous avowal of Botallus, that he was altogether confounded at feeling such a fracture, and that a thousand thoughts had fled across his mind, makes the case highly interesting: we are conscious, from the conclusion of the case, how dangerous these thoughts were to the patient, and must feel that when they present themselves to our imagination they should be resisted; had he yielded to those very natural fears, and made incisions to pick away the bones, I doubt not the boy would have been lost.

Parents have often with seeming perverseness refused assistance in the last extremity, and even the earnestness with which it is offered is a motive for refusing it; despair makes them unwilling to disturb the last moments of their child, which, being left undisturbed, recovers; what the fate of such a child might be if trepanned, must ever remain doubtful.

I was called once to a child, whose circumstances seemed so very desperate that I urged the parents to allow of an operation, which fortunately they refused. "This little girl, about twelve years of age, was playing with her school companions on the very steep declivity of the Earthen Mound: two of them were running, hand in hand, when this little girl, losing the hand of her play-fellow, rolled from top to bottom of the Mound, with continually increasing velocity, till at last she pitched with her head full against a low wall, at some distance beyond the bottom. She was carried home in a chair, stiff and motionless, perfectly pale, and without pulse; she hardly breathed; and we had no evidence of her being alive but a slight degree of warmth, which, after cutting off her clothes (for she was stiff as well as motionless), was difficultly increased to a natural warmth.

“ From this time she lay in a deadly stupor, with a blemish on one temple ; there was no tumor, but flat integuments, through which I imagined I could feel a fracture and depression of the parietal bone, while the signs of accompanying extravasation seemed very unequivocal : her limbs were stiffened ; her whole frame in a sort of tonic or permanent convulsion : her jaws firmly and immoveably locked ; her extremities cold, and her pulse oppressed and intermitting. In this state she lay for four or five days immoveable ; hardly was a tea-spoonful of wine and water admitted betwixt her teeth, which were firmly and immoveably closed. I was then persuaded, and remain so, though she happily recovered, that there was extravasation under the parietal bone ; and my persuasion was so great that, on the fourth and fifth days, I solicited her parents to allow of an incision, and even spoke to the clergyman, who was called to them at this dismal time, to persuade them to consent. On the sixth day she yawned widely, and from that moment her jaws were loosened : we could now put in a few spoonfuls of wine and water, and give purgative medicines ; but she lay still and dead, in the most profound stupor I ever witnessed. She began in the second week to stir the limbs of one side a little, and in two days more she stirred sometimes an arm, sometimes a leg, of the opposite side : then her eyes opened at times, and she began to mutter and speak ; but it was the fifteenth day before this low muttering came on ; and then, and till the twentieth, though her eyes were open, we had unquestionable evidence that she could not see ; a candle approached to the eye gave no sensation, the eye did not follow it, nor were the eyelids closed as

expressive of impatience of light, and the pupil was as much dilated as if she had lain in a dark place.

“ She now became restless, the struggling of the limbs of both sides increased, she put out her hands and stretched her limbs with a sort of trembling, and muttered perpetually. On the fourth week, she came to swallow more easily, to take the drink which had hitherto been poured into her mouth, and to speak rationally. She next sat up in bed, was raised into a chair, and gradually recovered her senses and her strength. She was then able to be led about the room, but two months elapsed before she could be said to walk: even then she was never left alone, nor walked unsupported. She was led about the whole summer in this weakly condition; but is now a strong and healthy girl.”

“ That excellent chirurgeon, Arnoldus Tholinx, and myself (says Ruinhuisen) were consulted about the child of a sea-captain, which had fallen from the upper deck of the ship to the bottom thereof, being the height of eleven or twelve feet: and here the trepan being judged necessary upon the dangerous accident's ensuing, and by us proposed as such to the parents of the child, but by them refused; we employed nothing but convenient fomentations, and proper ointments, and the like; by which means the child was happily recovered, to the great instruction of myself and the benefit of others *.”

That you may have every kind of benefit from such ingenuous communications, I shall represent to you one or two scenes on the best authority. “ Mr. Avellan † relates the case of a little girl fourteen

* Ruinhuisen, p. 153. † Academie de Chirurgie, tom. i. &c.

years of age, who, after a blow on the head, faintings, vomiting, and delirium, from a depression of the right parietal bone, lay in an oppressed state. Her condition plainly required the trepan, which yet her mother pointedly refused. The faintings and delirium continued no less than three months, the girl remaining in a state of idiotism or silliness ; but, in process of time, the depression vanished, and the symptoms entirely disappeared*.” “A little girl,” says Marchetti, “a child of the house of Ridi, having fallen over the stairs, and struck the occiput against a stone step, had a conspicuous depression of the skull, but without any laceration of the scalp ; the parents refusing to hear of incisions or other operations esteemed so necessary in cases of this nature, medicines alone were applied for abating the inflammation, and the child, opposite to the belief of all the medical attendants, was perfectly cured, not without

* At other times various accidents have prevented these operations, which the surgeons believed to be essential to the recovery of the child ; witness the case in the academy memoirs which immediately succeeds this. “A child of ten years old fell from a height of thirteen or fourteen feet ; tumors immediately rose on each side of the head, on its upper part, covering partly the frontal, partly the parietal bones, longer than two eggs. The surgeon opened the tumors ; found each parietal bone naked to the extent of an inch or more. On the left side, the fracture and depression were so deep and gaping, that a spatula was easily passed betwixt the depressed brain and the skull, while the coronal suture was separated, so that you could introduce a probe into it. Both the depression and a manifest effusion of blood upon the dura mater required the trepan ; and though it was resolved on, it was by some accident deferred, became unnecessary, the blood flowed through the fractures, the depression rose of its own accord, and all the symptoms vanished.”

L'enfoncement des os et un épanchement qui s'étoit fait sur la dure-mere, exigeoient le trépan : on s'y determina même d'abord, cependant il fut différé, et par ce delai l'opération devint inutile. L'écartement, joint à la situation que M. Duprey donna au malade, procura vers le cinquième jour une issue au sang extravasé, l'os se releva ensuite de lui-même, et tous les symptomes disparurent.

a conspicuous depression remaining ; she is married, has a family, and still survives in perfect health."

Perhaps there is no rule in surgery more correct in theory, nor better supported by authority, than that which warns the surgeon to beware of being too busy in raising the depressions of the skulls of boys ; perhaps a strong conviction of this was among the motives which induced Hildanus to speak of so many idle and puerile inventions for sucking up depressions of the skull, for he declares, in the most express terms, against using instruments, saying, "*Puerorum Calvaria ex casu deprimi posse nullis supervenientibus symptomatis.*" Scultetus, in place of labouring with instruments to raise the depression, wraps the boy in a warm sheep's skin. And Turner, a man of observation and strong good sense, says, "where there is a depression of the cranium, provided it be small, like the superficial dent in some pewter pots, the patient young, with convulsions, delirium, stupidity, or other mischievous symptoms attending, you must not presently go to work with your instruments, but treat the case as a contusion." "A gentlewoman," says Turner, "very nearly related to myself, has the most considerable impression of this kind, occasioned by a fall in her infancy, that I ever met with, there being room to hide a finger in the dent, on the back part of the head."

No other proofs need be required, since, always when by chance these depressions escape the busy inquiries of the surgeon, the patient is saved ; were any such proofs required, we might find them in the early work of the good old surgeon Berengarius, who says, "Not only in childhood, but in various ages, have I seen great depressions, and conspicuous cavi-

ties, with very remarkable fracture, cured, without any ill symptoms, by plasters alone. I have, at this very hour, a boy under cure, having his skull depressed, the depression most remarkable, without one ill symptom."

The practice of those who believe it to be their duty to scrape every fissure, and raise every depression, who are ever ready to go to work with their instruments, affords the most fatal and melancholy proofs of the improvidence of such practice ; and we find practical errors narrated, by the best modern surgeons, with a nonchalance, and want of consciousness, altogether astonishing. "I cured a boy," says Marchetti, "of seven years of age, who, from the kick of a horse in the forehead, had a very remarkable depression, which neither tripod nor lever could any way elevate ; but there being a fissure in one part, I betook myself to the rugin, dilated the fissure, so that the serous humour had leave to exude, while the medicines had leave, on the other hand, to penetrate to the dura mater, so that in the course of forty days, flesh being regenerated in the fracture, the wound was safely and soundly cured." But had the celebrated Marchetti been permitted (as it was a wonder his authority did not prevail) to trepan this little boy, to tear up the skull with his tripods and levators, it is possible at least, that even after such violence, he might have survived, and then the operation and the operator would have been applauded for saving the patient's life ; and had the elevation of the bone been accomplished, though with every circumstance of violence and rudeness, the operation would have become memorable. Such a case is that recorded by Mr. O'Halloran, in which every principle of sound surgery was

violated. He found a child with a depression of the skull with the integuments entire, and the senses quite composed and perfect, when, without any motive but his own unmeaning fears, he, in opposition to every good authority, cut open the scalp; and that depression, which had hitherto done no harm to the child, he elevated in the rudest and most shocking manner, making no fewer than four perforations in the skull of the child, thrusting into each hole a levator, and to his four levators he had two surgeons, who seem to have had as little tenderness as himself, for they pulled with might and main, till the depressed bone rose with a sudden spring. But here is his own narrative.

“A girl, about seven years of age, received a severe fracture, with profound depression, on the left parietal bone; the integuments were entire, the girl quite composed and sensible, but the depression was so deep that it could contain a very small egg. Such was her situation when brought to me half an hour after the injury. Seeing that it would require three or four crowns of the trephine to raise this extended fracture, I requested of Mr. Wallace, a military surgeon, and Mr. Pierce, to assist me in this charitable work. I removed all the integuments, wiped away the blood, and whilst these gentlemen with their fingers made compression over the bleeding vessels, I began to operate on the inferior parts of the bone. I then commenced a second on the upper part, and in a line with this; but two elevators, though acting at the same time, had no effect on the depression. Two more crowns were then applied to the sides of the bone, and parallel to each other. Four levers acting in conjunction, it astonished me to see with

what a sudden spring the depressed parts resumed their former station. Notwithstanding the great extension of this fracture, the loss of covering, and of the bone itself, by four crowns of the trephine, this girl never after had the smallest untoward symptom."

Is it by such narratives and such proceedings that the good repute of surgery is to be preserved? by no means. We should at first sight be inclined, both from the violence used in raising this depression, and from the success of the operation, to ascribe the patient's safety to the intrepidity of the surgeon; but what should we have said of Mr. O'Halloran's practice had he miscarried, and been unable, with his military assistants, his pair of surgeons and double pair of levators, to raise the depression, and yet the patient, after all kinds of violence being added to the depression, had lived? There is not in the narrative of this case any shadow of proof that the patient was saved by this mode of operation; the child was composed and sensible, had no bad symptoms, and would have had none to the very end of the cure, had she been left alone: it proves merely what is but too surely true, that often the patient survives the most imprudent things the surgeon can do.

I will now produce you evidence that I put no worse construction upon this case than it should bear. It will prove to you, that, even where the depression is broad and deep, where convulsions have ensued, where the surgeon, alarmed at these signs of danger, has made his incisions and his perforations, and tried ineffectually to raise the depression, the patient has survived both the depression and the ineffectual operation, which must ever be a violent one. Mr. Hill undertook, in an unfortunate hour,

the following operation. "A boy of the name of Carson, between five and six years of age, by the kick of a horse, had a long piece of the os frontis beat in flat: he slept sound, as the people termed it, about two hours, and then fell into strong convulsions. The extravasation was so great externally, that the precise quantity of the bone depressed could not be determined, till the blood was discharged by a horizontal incision along the depression, by which I discovered it to be of an elliptical form, extending above two inches across the forehead, and above the right sinus frontalis, with a fissure all round it. The external discharge not relieving him, showed that the perforation would be necessary; and, therefore, after allowing the first incision to bleed some ounces, it was stopped by dry dossils. Being determined, for the reasons formerly given, not to touch the depressed part, unless some symptoms should afterwards make it necessary, I continued the incision till there was room for perforating a quarter of an inch from the fissure, at the right end of the depression. The bleeding was troublesome; but no arteries required to be stitched, but were stopped by dossils dipt in ardent spirits, and applied for half an hour. After which, just as much of the pericranium was removed as was necessary to admit the smallest head of the trepan. The connecting blood-vessels betwixt the dura mater and skull were broken through the whole extent of the depression, being at least two inches; for so far I introduced the levator, without opposition, and attempted, with a good deal of force, to raise it; but in vain. After the extravasated blood was discharged, three intersected stitches were put into the first incision above the depression, and it

united in a few days ; and the rest of the skin healed in four weeks, without the intervention of any bad symptom. He is well, 1771 ; and the depression, owing to his youth, is so expanded by natural growth and the callus, as not to be much perceived."

If any thing could repress the presumption of a man of an adventurous temper, this must. To propose an operation under protest, that it was the only possible means to save the patient's life ; to attempt that operation ; to see the patient survive the depression, which had been declared fatal, unhurt by the additional violence of incisions, trepans, and levers ! Surely these facts should lead the surgeon, who had been in the habit of elevating inexorably every slight depression, into a new train of thought.

The prominent points of this case of Mr. Hill stand, in common sense and plain argument, thus : First, The depression, while it continues, does no harm, the boy being in his entire senses. Second, The surgeon is so alarmed at the very appearance of depression, that he labours with every degree of violence to raise it, his own reputation, as well as the patient's health, seeming to be at stake. Thirdly, Abandoning the operation, and leaving the depression as he found it, he puts three stitches in the wound, and so the integuments unite over the depression in a few days. Fourthly, The patient is no sooner recovered, and the wound healed, than the depression, which appeared so formidable to the surgeon when seen and felt at the bottom of a bloody wound, the depression, to raise which he willingly risked every thing, disappears spontaneously, so little is it off the level *.

* These are not solitary, nor even rare cases. Read the following from Mr. Hill. " February 24, 1750. Mr. Robert Rae, when a young

It is from no petulant desire to injure the reputation, or criticise the practice, of a man so justly valued by his profession as O'Haloran, that I introduce the following :

"Patrick Casey," says Mr. O'Haloran, "was thrown from his horse, with great force: the consequence was, fracture in part of the coronal bone, with great depression. I was requested, next morning, to visit him; and, seeing his condition, I was just proceeding to the operation, when a surgeon of the city appeared, who said he was employed by Casey's master to attend him. The depression was so considerable, that the lower edge of the fracture was beaten under the injured part; here I intended my operation, in order the more speedily and effectually to disengage the fracture: but this was opposed; it was observed, that trepanning so low down would leave a great deformity, and that the end proposed would be as well answered by perforating the bone at top. I opposed it in vain; I saw that the friends of the boy who were present, as well as himself, wished to have it done so. I trepanned, introduced the levator, but could make no impression, as the depressed parts were beyond the reach of the instrument. I now proposed a second opening on the lower edge of the fracture, the first being impossible to answer the end

man, fell backward from his horse on a rock, about twelve miles from Dumfries. By his foot sticking in the stirrup, he was dragged some way, till the girth broke, and left him with his head betwixt two stones in a rill of water, where he would soon have been suffocated had not a shepherd boy drawn him out.—A large piece of the left parietal bone was driven in backward to the lamdoid suture, with a fissure in the right parietal forward, being like a shepherd's crook; notwithstanding the larger depression, there was no extravasation; nor would the bones rise, though a very great force was employed; but they exfoliated like the former, and, the aperture being wider, the protrusion was greater. The cicatrix continued soft for three years, when it ossified completely."

proposed. This was not agreed to. It was observed, that an opening being made, no deposit could be formed, and that the depressed part would become gradually detached, and probably come away, which has sometimes happened. The sore was carefully dressed, but the dura mater never assumed a right aspect; however his spirits were good, and he had no complaint but what arose from the sore itself. The discoloration of the dura mater made me try, on the 15th, and again on the 17th, the effects of the elevator, but in vain!! He was up every day. The 24th, looking out of a window for some time, he perceived a slight chilliness; at bed-time he grew hot and feverish, was very restless, and had a strong shaking fit. This alteration was ascribed to his making too free with himself. But I saw and dreaded the consequences. I told the people that these alarming symptoms proceeded not from cold, but from the constant and uniform pressure of the brain; and that if any chance remained for his recovery, which I much doubted, it must be by a speedy removal of the cause; and if they consented, I would not shrink from this disagreeable business. I directly made the second perforation, and soon raised the part; but, alas! the mischief had been already completed. That day and the next he seemed a good deal lighter; but, about ten at night of the second day, his neck was observed to be covered by a bloody ichor issuing from the sore. Next morning his pulse was more languid, and the dura mater quite black. Towards night the bloody ichor increased; he became slightly convulsed, with stupor. About ten the substance of the brain poured forth, and he expired next morning."

This case reminds me of the circumstances of an

operation in which I was a party ; where, although I was obliged to be a witness and unwilling assistant in much mangling, I saved the man a great deal more. There was, along with a wide fracture of the parietal bone, through which the extravasated blood was seen, a slight depression of it at one corner of the fracture ; the trepan was applied ; the extravasated blood rolled out ; the duty of the surgeon was, according to my apprehension, completely fulfilled ; but he was urged by others who were present to raise this depression, with a degree of earnestness which left him entirely responsible for the consequences. I most unwillingly witnessed, but would not consent to assist in this part of the operation. After extreme violence (for always the violence is extreme where the surgeon works till he is foiled) it was found altogether impossible to elevate the depressed bone. The operator was now called upon, under the same responsibility, to make one, or, if necessary, two perforations, on the sides of the depressed portion, to raise it. I saw plainly that, if the operation, now protracted for an hour, should continue still another hour, the man would be carried off delirious ; that if the skull was widely opened by two perforations, and by the tearing away the depressed bone, his chance for life was very slight. I said across to the surgeon, that if he would permit me, I should most willingly take the responsibility upon myself. On his consent, I put aside the busy fingers that were searching for depressions, clapped a piece of lint on the dura mater, and conveyed him to bed, where he mended daily, and became a very stout and healthy man.

Mr. O'Haloran seems willing to vindicate himself, and is quite unconscious of the indecency of such

repeated operations : he says, “but, alas ! the mischief was already completed ;” an expression neither delicate nor modest at the conclusion of a case where every kind of violence had been committed. A boy was trepanned, while in his perfect senses, in spite of his own remonstrances and those of his friends, this only choice being left him, viz. whether he would be trepanned at the top of his head or at the bottom. Very wide indeed is the difference betwixt a case thus tortured with frequent and partial operations, from that depression in which the integuments are laid nicely upon it, and the case committed to nature. A perforation was made, the levator used in vain, the dura mater first hurt perhaps by the depression, then injured by every kind of tampering, began to inflame ; yet his spirits continued unabated ; he had no complaint. Mr. O’Haloran, perpetually watching the aspect of the sore, imagining the dura mater discoloured, first on the fifteenth, and again on the seventeenth, introduces his levator, and persists in poising up the depressed part. Still the boy’s health continues good ; he is daily out of bed ; on the twenty-fourth, he is at the window, takes cold, and has rigors. Then a new perforation is made ; the depression is forcibly raised ; and the patient dies on the third day after. Far from wondering at the fate of this patient, I can safely say I have often seen such doings, and never yet saw the patient survive. Indeed this is the very case to illustrate a rule to which I solicit your attention. “Whatever you do, do with that kind of decision which may entitle you to success. If you resolve not to operate, then, after picking away the fragments, and dressing the wound softly and gently, commit the case wholly to nature.

If you are to operate, do all that you have to do at once, nor think of changing your mind with every variation of the symptoms, renewing your trepannings and using the lever at the very moment when inflammation is threatened."

Is it not mortifying, that the operation, on which the surgeon values himself so much, should be thus doubtful! That, when he has, with the usual eagerness to raise depressions, used every justifiable and every unjustifiable violence in vain, the patient lives in spite of the depression! in spite of his operation! This is a sad deception to which we are exposed; we are probably assuming to ourselves the merit of having saved those by our operations, whom we have only not destroyed, and such, perhaps, are all our boasted cures; that which is thus proved in a few cases may be suspected in many; for though there are not many in our profession who have had the strength of mind to commit such cures to nature, whenever, by inevitable causes, we are compelled to suspend our designs, nature achieves the cure.

The bloody decrees of the surgeon against all who have depression of the skull are never so absolutely suspended, as where the ill constitution of the air in a great hospital is known, by the experience of centuries, to destroy all those who suffer operations on the head. Under this imperious necessity was Desault, surgeon of the Hotel Dieu, who, during his administration, declined, even in the most urgent circumstances, to perform the operation of trepan, and found in the end how true the maxim is which I have just quoted from Perusinus the Roman surgeon: "*Magis servari eos qui citra scalpelli operam curantur, quam quibus cutis inciditur et os aperitur.*"

Dessault's clinical practice, when he merely allowed the patients to lie undisturbed and quiet, with a poultice to the fractured and depressed skull, and a dose of calomel to move the bowels, exhibits a splendid series of examples of what nature, undisturbed by partial operations, will do; and taught Dessault himself, and proved to the profession, how great a proportion of those who are trepanned would live without the help of surgery; for many recovered after lying long in a state of stupor, accompanied with symptoms every way alarming, such as would, in any other circumstances, have induced Dessault or any surgeon to have trepanned.

But Dessault, who was too much inured to bloody scenes to fear operating, and too indifferent to the reputation of being an operator to feel any thing of the passion for cutting and trepanning, tried, for the first time, the great and important experiment of leaving his patients, having fractures and depressions of the cranium, at quiet in their beds. Among others, one Joseph Gautier's condition was in every sense interesting, but especially in the slow absorption of that general suffusion of blood, which we must presume to have taken place in the brain after so violent a concussion as he seems to have suffered, and the gradual recovery of his senses, proportioned in all likelihood to that absorption, and accompanying it step by step. "Joseph Guatier, a hale young man, twenty-three years of age, was found in the morning under a window, which he was accustomed to scale when late abroad, lying in a state of stupor, and bathed in his blood, which streamed from his mouth and nostrils, and from his left ear. When he was

brought from his village, a few miles distant from Paris, into the Hotel Dieu, he was still bleeding from the mouth and nostrils, and insensible ; the body cold, the face deadly pale, and the pulse small and contracted. On his head were many marks of contusion ; and one over the lower and fore part of the parietal bone was accompanied with a depression, deep in the centre, and rising towards each side. The clavicle, which was also fractured, being set and bandaged, the head was wrapped in a large poultice : next day he was better ; the poultice was continued, and he was bled in the foot ; and in the evening his senses in some degree returned. On the sixth, he began to articulate, but indistinctly. By the seventh his senses were restored ; his taste, smell, and touch were perfect, but his vision somewhat impaired ; he heard also imperfectly ; and, in respect to his intellect, the faculty of memory seemed much weakened ; he could by no means recollect whence he came. He had no pain : it was on the tenth day that he first rose and walked. On the fourteenth, he walked abroad upon the bridge, and took his airing there daily, till the twentieth, when, the fractured clavicle being re-united, the bandages were undone. His memory mended daily ; his hearing became more acute ; his eyes gained strength, but still the pupils remained dilated somewhat wider than in the natural state, and the skull remained manifestly depressed. On the twenty-seventh, he was carried into the hall at lecture, and shown to the pupils ; this was before he was dismissed. At the end of three weeks, he returned to show himself, his senses being entirely restored, and his memory perfect ; the pupils of his

eyes had recovered nearly their natural smallness, except that the pupil of the left eye continued a little wider."

In this case, when about the third day, the bumpy swelling and ecchymosis began to subside, they felt the fracture and depression very distinctly, the fracture being of a circular form, about two inches and a half in diameter, with one edge more raised than the other ; and after his recovery it was still more plainly felt.

"* The invariably fatal consequences of using the trepan in the Hotel Dieu deterred Mr. Dessault from using it on this occasion ; nor had he any reason to repent of his resolution." Even when the depression seems to produce the worst signs ; when the patient bleeds from the nose and ears, and lies insensible ; when his senses are not merely stunned and shocked, but so materially injured that they recover slowly, it is safe to leave the depression untouched ; to trepan where there are no such signs would be destruction. Mr. Abernethy "had a man brought to St. Bartholomew's, who was hit on the forehead with a brick : the frontal bone was fractured half an inch above the orbit ; the fracture measured two inches in length, and the upper portion of the brow was depressed about the eighth of an inch. He was not even stunned by the blow, and walked to the hospital without assistance, complaining only of soreness in the wounded integuments. He was bled ; was confined, much against his inclination, to a scanty and liquid diet, and was purged every second day. This patient did not experience any illness, and the wound soon healed."

* Journal de Chirurgie, tom. 1. p. 20.

But had Mr. Abernethy been a surgeon of the complexion I have sometimes ventured to describe ; had the patient been confined, much against his inclination, to an operation-table, and trepanned, there is little doubt I think how it would have fared with him.

But this is the difference betwixt the proceedings of a man of sense and experience, and a man of theory. There has been too much of surgery ! A master in surgery can look, calmly and composedly, on that depression upon which a novice would instantly fasten his levers ; he can see the scalp whirled off from both sides of the skull ; the parietal bones laid bare ; the temporal and frontal bones also denuded ; part of one of the bones beaten in, for an inch in length, and more than the eighth of an inch in depth, and a fracture extending downwards to the basis of the skull,—and yet refrain from trepanning. He can see a fracture similar to this, with a part of the bone depressed even a quarter of an inch below its natural level, without thinking of making an effort to raise it ; and can even see the boy sicken on the third day, with headache and disturbed sleep, with dozing and a slight convulsion, without being moved to do any thing rash or unbecoming. While the tyro, just sent out from the schools, makes diligent inquisition into all the circumstances of a fracture, will allow not even a capillary fissure to escape his jealous search ; and, where there is hardly any visible fissure, imagines such internal damages as may entitle him to “set to work with his instruments,” and perform that great operation, which is to be the pride of his future years, “boasting of that which is his shame.”

It is not honourable to our profession to have it thus proved, that while the opinion is almost universal

that depression of the skull must oppress the brain, the fact is entirely the reverse : that, wherever by chance such depression has passed unobserved, or the friends have refused all surgical help ; wherever, by the deepness and firmness of the depression, it has been impossible to raise it ; wherever the danger of infection has deterred the surgeon from operating, or he has resisted the temptation, and, by an effort of good sense, has ventured, at the risk of his reputation, to disregard the established maxim, the patient has done well. This is enough to throw a doubt upon all that has been doing for centuries ; and makes it a duty to tell you plainly, and without reserve, that the desire of leaving, in a dangerous operation, nothing undone, is not wise, and leads to nothing but rashness and violence. It is a prejudice so natural that it should be resisted ; it is a manner of reasoning, which is worse applied to this operation than to any in surgery. To leave a Second Stone in the Bladder, while performing the operation of Lithotomy, is to do nothing ; to leave diseased glands in the Axilla, when extirpating a cancerous breast, is to do worse than nothing : but to leave a slight depression of the skull, even when the patient is stunned and sickened, or any depression where there are no bad symptoms, where the integuments are entire, when the patient is young, is to make a just and modest sacrifice of our wishes and prejudices to the safety of our patient.

[In this chapter the reasoning is highly ingenious, and the practical conclusion correct and most important. There, however, appears to be room for comment or observation.

That lamentable mistakes have been entertained on the subject of compression, there can be no doubt ;

and perhaps the sources of these mistakes are not sufficiently dwelt upon in this volume. Insensibility from other causes being very commonly attributed to compression, is the source of these mistakes.

Insensibility may be consequent on concussion ; it may be consequent also on inflammation, and on irritation of the substance of the brain ; and the insensibility proceeding from these causes is every day attributed to compression caused by the depressed bone.

A man has fallen from horseback, and he is brought home insensible, and with a depression of the skull : if we had never seen a man in the same state of insensibility without a depressed bone, or a man with depressed bone without insensibility, it were allowable to conclude that the stupor proceeded from the state of the bone, and not the concussion of the brain.

A man having an injury of the head, after a number of days, falls torpid and oppressed ; an incision is made upon the scalp ; the bone is discovered to be fractured and depressed ; and he is trepanned. Now, we do not object to the practice, but to the reasoning. If it is the depressed bone which directly produces these symptoms, they should have continued uniformly from the time the injury was inflicted ; but as this has not been the case, we must look for the cause in some new condition of the brain ; and we shall find it in the inflammation and suppuration of the surface of the brain.

If a man has the surface of the skull deadened by a blow, and if, after the bone has been dry and exposed, and when it might be expected to exfoliate, the man fall into a condition of oppression and insensibility ; it still is considered a case of compression.

He is trepanned, and the dead bone and a little pus are taken off the surface of the dura mater, and by and by he recovers his senses. This is deemed an excellent example of the brain relieved from compression.

All this confusion arises from the misconception that there is no other source of oppression but compression; whereas concussion, inflammation (either attended with purulence or serous inflammation), but above all, irritation on the surface of the brain, will cause insensibility. The brain, injured by violence, may suffer a condition analagous to apoplexy; but it may also suffer a state of irritation similar to epilepsy. A small spicula of bone irritating the brain, or a portion of bone dead and acting like a foreign body on the surface of the brain, will be attended by insensibility; and on the removal of the cause of irritation, the senses will gradually be restored.

From this view, however, it will be perceived, that when a part of the skull is broken and depressed, there is another reason besides that of compression of the brain, for applying the trepan. Whenever a piece of bone is so isolated or separated from its connexions, that it must die, it should be taken away; for it produces exactly the same effect on the dura mater, and ultimately on the pia mater, as if a foreign body lay there. When, from the form of the fractured bone (judging from what is external), you conclude that a sharp angle or edge presses in upon the membranes, the depressed portion should be raised, if not entirely removed. See further on this subject in the next chapter.]

EXCEPTIONS TO THE GENERAL RULE OF LEAVING DEPRESSIONS TO NATURE ; OR DEFINITIONS OF THOSE CASES WHICH ACTUALLY REQUIRE THE USE OF THE TREPAN AND LEVER.

I know not whether I have persuaded you, but I have myself, to the most entire conviction, that of all the injuries of the skull, that which is the most dreaded, viz. depression, is the least hurtful. I have seen such happy recoveries, where the depression was left undisturbed,—such melancholy scenes when depression was raised at the expense of large perforations, and extensive openings of the skull, that I confess myself very indifferent to this kind of danger, and very doubtful of the propriety of such operations. The practice, which I think so very hurtful, it is my duty to oppose ; and I shall now endeavour to keep my promise with you, of explaining, first, the general rule, so as to give you confidence, viz. “That you are not to trepan nor elevate every depression ;” and, next, “the exceptions, so fully as to prevent you, while you avoid the fault of hurry and impatience, running into any fatal error from neglect.” You will find that I have considered these exceptions seriously, and that I retrace my opinions on this point to observation and experience.

First. Nothing is more essential than that you should have clear conceptions of the motives for applying the trepan ; it is one great point gained, to say with confidence, that “this of depression is not among the number.” I never saw depression occasion stupor, nor the elevation of it bring relief ; but many times when the surgeons have been busy, in a mob, strug-

gling and elevating depression, in a manner almost as rude as that of O'Haloran with his four levers, the boy or man has been struggling, remonstrating, and making every kind of resistance. Nay, it is most singular, and not to be found in any equal number of injuries of the head of any other complexion, that, in all the instances of deep and wide depression which I have just quoted, the patient was sensible.

Secondly. Though this general principle cannot but be acknowledged, it remains to be circumscribed by certain definite rules. As we should take different measures in a clean cut of the integuments, and a rude and mangled wound, where the parts were bruised, lacerated, and unfit for adhesion, we must take various measures in fracture of the skull, according to its peculiar circumstances; and as there are circumstances which are found to prevent the adhesion of wounded integuments or wounded scalp, there are many which will prevent the healing of a fractured skull, and cause it to inflame the bone, and affect the dura mater: These are the exceptions, and they must be defined. It is not by present pressure that fracture is dangerous; therefore, when it runs in a right line, when there is a general depression, but no particular point forced in upon the brain; where the declination of the depressed from the sound part of the skull is gradual and uniform; when the whole line is generally depressed, and the central point sinks deeper; though you can feel the hollow with your finger, and can see it (not without apprehension) when the coagulated blood is discharged; yet as the centre does not intrude upon the brain, as this point does not dip so as to present points or spiculæ to the dura mater; as there is no rough

edge presented on the inward surface, nor any rude shock, like that of a ball, to deprive the bone of life and prevent its healing ; as it is broken by such a force as fractures other bones, and is surrounded with a mass of cellular substance, thickened by inflammation, and by the injection of blood into it, such as reunites other fractures ; the skull, pericranium, and dura mater, all mutually adhere, and the effects of such depression are never felt*.

Upon every principle, and every precedent, we are bound to commit such a case to nature : it daily happens that boys have the forehead thus flattened by the kick of a horse ; sometimes dangerous spiculæ, as where the caulkers of the shoe have pierced the bone, are cut away, and very properly, with the trepan : sometimes, too, the bone is elevated ; but very often it is left untouched, the wound brought together, and dressed dry, and the parts reunite and heal as in any other wound, a visible, but harmless, depression remaining. While the integuments are entire, the inducement to leave them so is particularly strong ; when left entire, the consolidation of the parts, and the absorption of the blood, is certain, or almost so : to open it, is to convert a simple into a compound fracture, with every danger of its not healing favourably. I remember to have put in my finger, through a wound in the scalp, and felt, in a very old woman, near seventy years of age, a depression of the parietal bone of two inches of extent, the fracture wide, the edges rough, and the depressed bone apparently driven far below the unhurt part of the skull ; and the only notes I have taken of the

* Not felt as compressing the brain, but to be watched as probable sources of inflammation.

case are, that she never passed one sleepless night, nor had one hour of sickness; her appetite never declined; that she sat up to be dressed, and kept her bed a few days only, through precaution rather than for want of spirits or strength, and recovered as from the most ordinary wound. In those less advanced in life there is less danger; and we have the best authority (the authority of those whose general practice is to use the trepan) for affirming, that in such cases, not only the present depression does no harm, but the fracture unites, and the wound closes; the patient may even be seized with shiverings, and the part with suppuration (strong reason for suspecting a carious bone and pus under it), yet such abscess, being punctured, will discharge "a considerable quantity of matter," and the patient be in no danger*: nay, we are assured, on the same impartial testimony,

* "Mrs. Grogan fell from a window into the street, and received a violent contusion on the front of the coronal bone. I saw her the next morning, and found a considerable tumor, which to the touch seemed to contain some fluid; but as I had seen many similar ones subside in four or five days, by the use of compresses wet in spirits, I treated this in the same manner. The swelling, however, remained, and in five days I proposed opening it, which she would not permit. The sixth day she again sent for me; the tumor was still the same, but the fluctuation not so sensible. I laid open the part, and a good deal of coagulated blood was discharged. She complained all that and the next day of pain, and a thin bloody sanies came from the wound. I found not only the bone bare, but a considerable fracture, with some depression. I pressed with my finger the sides of the bone, but it remained firm to the touch, and she felt no uneasiness from it. I kept the wound open for some days, and finding no alarming symptoms, suffered it to heal, which it did by the end of the month. I recommended her to keep the part covered for some time, on account of the thinness of the cicatrix. This she neglected. In some days after, leaning over a garden wall, with a smart wind in her face, she was seized with a violent pain, and imagined the wind was piercing into her head. She slept little, and was the whole night in a fever. Next morning, I found the forehead greatly swelled, and let out a considerable quantity of matter. In some time it got well; she had it covered with adhesive plaster, and never after complained."

that a bone loose and somewhat depressed will fix again*. But in boys especially, where depressed bone has in general no sharp edges; where the skull rather bends than breaks; where the bone is vascular and growing, and the circulation in it and in the integuments sound and vigorous, the chance of fracture healing is so great, that I would not presume to touch it, unless in most peculiar circumstances; especially as in boys the dura mater is too tender to serve as a second skull to sustain the pressure of the circulation within the brain: wherever it is necessary to make large openings in the cranium of boys, protrusion of the brain and death ensue.

It is not then the present but the remote consequences of depression we have to dread: a depressed is more apt to become carious than a direct or linear fracture; and it is as a fractured Rib or Sternum inflames the Pleura or Pericardium, that depressed fracture of the skull by becoming carious inflames the brain. This is an accident which may happen in any form of fracture, where the bone is but laid bare, or scratched, or punctured, as well as where it is depressed; it is one for which the surgeon, who has endeavoured to reunite the fracture, can be no more blamed than he could be blamed for an extensive suppuration of the scalp, where having brought the lips of the wound lightly and nicely together, and taken every pains to prevent suppuration, it had yet suppurated; but it is an accident so frequent, and indeed so much depending on peculiar forms of fracture, as to occasion a variety of exceptions to the general rule.

* Let us not be carried too far; this may happen, but the chances are that suppuration will take place under it.

Thirdly. The first exception which I would explain to you is not of this nature, but depends on other concomitant circumstances. A fracture, with or without depression, may be of such extent as to indicate great violence, the concomitant symptoms announcing extravasation. The fracture traversing the channel wherein the great branches of the arteries of the dura mater are lodged, they are often lacerated, and pour out much blood, which may be actually seen oozing through the chinks of the fracture, and in such circumstances it is our duty to operate : but then our sole motive for operating is to relieve the brain from the blood which oppresses it, not on account of the fracture, which only marks the place of the chief violence.



This represents in truth the head of a very stout sailor lad, who, in going out upon the main-yard, to get in the studding-sail boom, fell clear from the height of the main-yard: no stay nor tackle broke his fall; he had not a wrist nor any part pained or bruised; he lighted full on his forehead, which bore the whole force of the fall, and, by hitting a cat-head (a solid projecting clump of timber, round which the tackles are secured), his skull was fractured with deep and wide rents, running downwards towards the basis, in every direction. This happened on Sunday evening; he was immediately carried down to the cabin, and lay long insensible, and when he revived, found himself cold, giddy, sick, and powerless, and continued to vomit for some hours.

On Monday, when I saw him, there was no delirium nor confusion of intellect, night nor day; no faltering of the tongue; no dilatation of the pupil; no sign nor degree of palsy in the left side, and the vomiting had ceased. He complained of nothing but of indescribable suffering in his head, and a sort of oppression and misery during the night; yet his condition was very decidedly marked by a sign, which I have seldom found deceive me, a slowness and marked intermission of the pulse, which, throbbing slowly and heavily, pauses at every fifth or sixth beat. The wound in his forehead was right-lined, of small extent, about an inch and a half; not mangled nor lacerated; the lips not puffed up by extravasation, but simple, as it had been made with the blow of a poker; and through this wound the probe, passing obliquely, discovered a slight depression, a rough edge of bone, and wide fractures, through which the buttoned point of the probe might

have passed. His condition was singular. He was a big and fleshy lad; and, from the steadiness of his posture, the sluggishness of his motions, the manner in which his limbs were folded, and the slow and oppressed way in which he spoke, from the slowness of his breathing, together with various indescribable circumstances, one felt, while standing over him and rousing him to answer questions, as if conscious that he lay heavy on his bed *. His answers, even to the most curious questions, were circumstantial and correct; but they were extorted by urging him to reply: his answers to each question were delivered slowly, after drawing a long breath, and with an oppressed sigh. He seemed to feel great oppression at the *scrobiculus cordis*: his head always dropped upon his breast; and his hands, when you raised them, dropped heavily by his side. You were conscious of the pain it gave him to renew a conversation, by the slowness and sighing with which he began his replies. He lay still, oppressed, breathing slowly, with deep inspirations, and he had a corresponding pulse, for it throbbed slow and heavy, beat just 50 in the minute, and at every fifth or sixth throb, it paused distinctly the space of one slow pulsation.

His suffering during the night, he said, was inexpressibly great, but it was such as he could in no shape describe. He was told how doubtful his condition was, and how likely that we should advise him to submit to an operation. After passing one night more in this oppressed condition, he allowed us to

* I do not scruple to copy expressions of this inaccurate kind from my case-book, when I find them, however incorrect, to be suited to convey those lively impressions which one has only in the moment of looking upon a patient.

elongate the incision, making at the same time a crucial one, by which these terrible fractures were displayed; but the inner surface of the flaps of skin was so exquisitely sensible *, and he was so far from feeling all his misery, that he insisted upon being carried to bed.

But, two nights more of that indescribable suffering, which he had tried to express to us, quite subdued him. He said, "Whatever we pleased to do with him, was now welcome." The flaps of scalp were now, on Thursday, in a state of suppuration; the black blood was, at the time of incision, distinguished through the fissures; and upon the circular piece of bone (d) being cut with the trepan, rolled out in large clots. I could feel a great hollow betwixt the skull and dura mater, which was depressed by the extravasated blood, and the probe pressed along unobstructed for several inches, in every direction, from the trepan hole. To talk of repeating the perforations till an extravasation of this extent were uncovered, would be to think like a school-boy: the process was in this case simple and uninterrupted. The patient's anxieties and oppression were gradually relieved. He was trepanned on Thursday; on Friday he felt quite relieved; on Saturday, his slow, throbbing, and intermitting pulse, had risen from fifty to

* I cannot but mention here with approbation, the thin plates of iron used by Mr. Croker King, as Defenders. I have often seen much crying and struggling, severe and indecent violences used, the operation much protracted, and conducted altogether in a manner which must have shocked every spectator, from the want of them. Something of this kind should be in every trepan case; this measure of precaution prevents one of the most meritorious and necessary acts of professional cruelty from both appearing more barbarous, and being actually more painful, and less easily accomplished.

eighty in the minute ; and at each dressing the blood, diluted with a sort of serous exudation from the surfaces, melted and flowed out. At the first dressings, I made way for its flowing out more freely, by introducing the probe, wrapped in oiled lint, and moving it gently round betwixt the skull and dura mater ; and as the dura mater rose, which it did visibly from day to day, it assumed a vermeile colour : the scalp, bone, and dura mater were, in course of a fortnight, one undistinguished mass of red granulations ; the process of healing was rapid and uninterrupted, not even interrupted by the loosening of a small piece of bone, which was partly cut by the trepan and partly insulated by the fracture, and which I picked away, without the help of forceps, with the probe. I find that, on the Sunday following, I had been obliged to turn out large clots of blood with the probe, which presented at the trepan hole, and extended far under the skull ; and that, on the following days, I was occasionally obliged to use the syringe, with tepid milk, to wash out clots.

Fourthly. Yet you must perceive, that it is not in such cases, that the gaping fracture, or even the excessive depression, that is an object of concern, but that the extravasated blood is at once the cause of the danger and of those signs which denote its existence ; and those signs of extravasation may be so decisive, especially when conjoined with fracture and depression, as to induce you to cut open the integuments and perforate the skull. This sketch represents the head of a fine sailor boy, of about fourteen years of age, spirited, active, and very thoughtless. While the vessel was unloading, he tripped in skipping about the deck, pitched headlong



into the hold among casks, and was carried up into the air in a state of stupor, bleeding from the nostrils and vomiting. There was no external wound, but a universal extravasation of blood into the cellular substance of the scalp, especially over the right eyebrow, by which the eye was almost closed. It was some time before he was removed from the ship in the roads; and when I first saw him, it was easy, through the integuments, swelled as they were, to distinguish fractured edges, and a depressed bone; but the extent or form of these could not be ascertained, and indeed they never should have been with me a motive for making incision into the swelled scalp, but that he lay still in a state of stupor, vomit-

ing, and bleeding from the nostrils : his stupor was not the deadly snoring of the apoplectic state ; it had the peculiar character which I have just attempted to delineate. He could be roused, was sensible and rational when excited, but still he was in a state of stupor, into which he instantly relapsed. Generally the removing the patient to an operation-table, and almost always the first incisions, excite the patient, though delirious, he becomes rational, though torpid, he is roused ; yet still, even when thus roused, his actions bear the character of stupor or delirium. This boy, when carried to the operation-table, was roused to a perfect consciousness of every thing around him ; and, when the operation was done, said, “ I think I have borne it with spirit.”

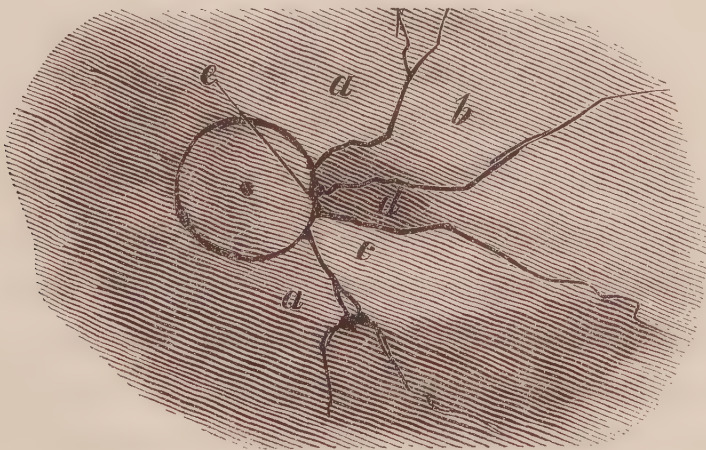
This boy then was perhaps a fit subject for the experiment of trying how far the powers of Nature might prevail, in at once supporting the system under oppression, healing wide fractures, and absorbing much extravasated blood ; for while there was such extravasation outwardly, along with conspicuous fracture of the skull, there was great probability, almost a certainty, of extravasation within. It was an experiment I did by no means feel myself intitled to make ; because the stupor, the vomiting, the hæmorrhagy from the nostrils continued : I therefore made an incision into the tumor, a long incision, which, directed by what I felt without, uncovered a long fracture, the circumstances of which are represented in this sketch. The lower part of the forehead was more swelled with saggitation ; the eye was more closed ; the edges of the incision, when laid aside as here represented, were more choked with coagulated blood than can be well represented in a drawing : the coagulated blood was also injected so into the

cellular substance of the pericranium, that the fractures could be better felt than seen: but one great fracture (a) running down the forehead, passed into the orbit, and was so very wide that it easily admitted the handle of my scalpel: the other limb of the fracture (b) run round in the direction of the coronal suture; the whole piece and corner marked (c) was deeply depressed, and so far locked under the edge (d) that it was necessary to make those two perforations, and to cut off a small projecting corner with the finger-saw, before we could think of using the lever. The blood rolled out through the first perforation. The depression of the dura mater by the blood was as great as in the former case; the circle, in which I could with the probe feel it detached, was as wide. The rising of the pulse, which had been oppressed; the recovery from the stupor; the granulation of the dura mater, and the closing of the wound; and the daily issue of clotted blood, make this, in all respects, a just parallel with the case I have just related. The extent of the wound was such, that the boy was not dismissed till the 9th of January, the 7th of September being the day of his fall; but what surprised and gratified me was this,—The piece of bone, which had been depressed and elevated, actually moved with each pulse of the brain, so loose did it lie upon the dura mater. I feared, when I saw the dura mater through the trepan holes, red and granulating; when, on the 20th day from that of the operation, I found also all the exposed part of the skull covered with a fine and florid pile of granulations, this triangular piece of bone excepted (which continued yellow, quite bare, and still moveable), that it must become entirely carious, and exfoliate; and that this, by protracting

the cure, or by its exposing the brain, might bring the boy into new danger. I had this impression on the 30th of November, and marked it in my daily report; but by the 6th of December, the same pile of florid granulations had crept along over the whole surface of this portion of the skull, and by the 14th the whole wound was cicatrized.

Such wide and gaping fractures, then, imply a very heavy blow, or a fall from a great height: I find them often accompanied with deep apoplectic stupor, with palsy of one side, dilated pupils, and involuntary stools; with groaning and sighing, an uneasy tossing from side to side in bed, as if from oppression, and a frequent raising of the hand to the affected side of the head.

Fifthly. There is a kind of danger inseparable from certain forms of depressed fracture, which no experienced surgeon will despise. The fracture, having no particular point depressed, causing no stupor, and attended with no ill signs, is by no means a fit subject for operation: but, where the fracture is



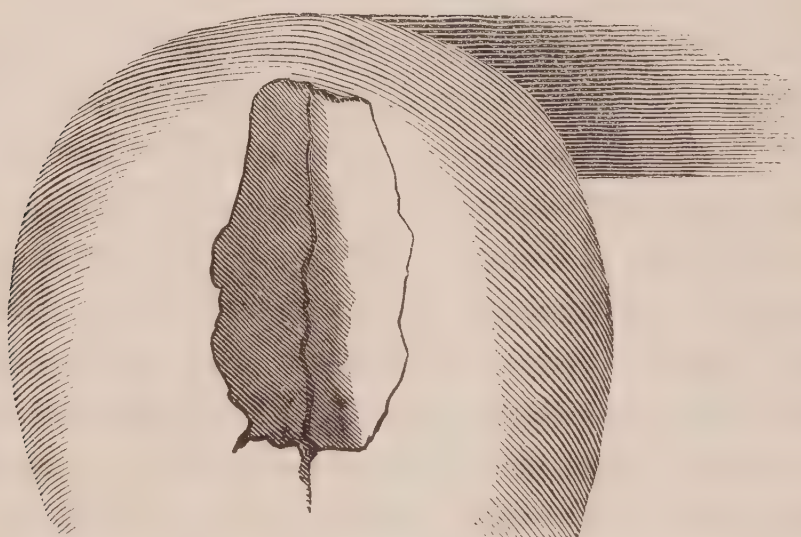
radiated and pointed, where the bones do not “lie pushed or loose upon the dura mater,” and yet are much shivered; where not a long flat edge is driven

under the sound bone, but particular points are depressed, presenting probably on their inner surface spiculæ and irregular and jagged edges, there is imminent danger, not from the depressed bone lying heavy upon the brain, but from its points pricking the dura mater, whence, on the eighth or tenth day, inflammation extends from the membrane to the brain, shiverings and tremors come on, and the patient dies. It is because the skull consists of two tables, and not by the peculiar fragility (though it is more fragile) of the inner table, that points and spiculæ of it are so apt to be driven into the brain: when the pointed portion (d) is driven below the level of the contiguous parts (b and c) it leaves behind it the outer table of each of these portions, but it passes the inner table, and, as it is driven inwards, every inequality, or angle of the fracture, makes a resistance by which splinters are not only carried before the point (d), but driven vertically, like pins or sharp wedges, through the dura mater. The experienced surgeon distinguishes at a glance the forms of fracture in which there is danger of this kind: and, in a fracture of the form here described, radiated, pointed, and depressed, as there is no room betwixt fragments lapped over other, like fingers when plaited and squeezed together, to admit a lever, I think it right to apply the trepan at the angle (c), (as usually there is such an angle in every fracture of this species), through which the lever, being introduced under the depressed points, raises them, and the probe, being turned round within the skull, will ascertain whether any rough edges still present, or whether any spiculæ or dangerous points stick in the membrane.

Sixthly. Fractures of this form may prove danger

ous, but depressions of the kind which I am next to describe must be so. The form of depression represented in the next drawing is such as happens when a man is thrown from a stumbling horse, and pitches with his head directly against a stone; or when he falls from a yard-arm, for example, and pitches upon the deck; or when a block and tackle, or a corner-stone from a building, falls directly upon his head. This fracture is described by the ancients under the title of *Cameratio*, the *camerated* fracture, as resembling the inverted tiles of a house; the centre is depressed in a direct line, the sides decline towards that centre, like the form which the two hands make when laid together edgeways. The form of this peculiar fracture has been but too minutely described; while its character has been less an object of attention, though, from its very form, these inferences are plain: First, That in consequence of its great extent, both lengthways and from side to side, the oppression of the brain, if such an effect could be produced by depression of the skull, should be most manifest; yet I affirm, from experience, that such effect is rarely felt, and shall prove, at the least, that oppression of the brain is not inseparable from this kind of depression: Secondly, I shall prove, That from the depth to which the central line, or direct fracture, is depressed, there must invariably be presented two rough and very dangerous edges, which, by irritating the *dura mater*, will cause suppuration: Thirdly, That though the patient should escape this danger, the circular fracture or crack which surrounds the whole, and which must invariably accompany depression of this form (without which indeed the bone, in an adult at least, could not yield), must

almost always insulate the depressed pieces, they must in nine of ten cases become carious, and to prevent these manifest dangers, I imagine it to be clearly the duty of the surgeon to elevate and pick them away, by pressing in his lever betwixt the edges of fissures usually very wide; or, this being either impracticable, on account of the wedge-like impaction of the depressed portions, or dangerous from the dipping of one end of so long and broad a fracture, while the other is rising, he should apply the trepan in the manner represented, applying successively the crowns of the trepan (a, b, and c) till the bone can be raised without being turned in upon the brain.



The case, which I have selected for illustrating this principle, is that of an old man, of the name of Thompson, who might have been saved by a timely operation, but who was lost by delay. He had fallen headlong down the precipice of the Caltonhill, fractured his skull, had a depression of the depth and extent you see marked in this slight sketch, a double depression in the very course of the great longitudinal

sinus and of the falx, which, if any thing could oppress the brain and disorder its circulation, should have produced that effect: but so slightly was he affected, that nineteen days elapsed without himself feeling, or his friends suggesting, the propriety of procuring assistance. At the end of twenty days, this was his condition: The depression was manifest to the touch and to the eye; the whole extent of the bone was black and bare, and a pale granulated fungus surrounded it: he had never, from the moment of the accident, had one hour of sickness, or vertigo, or any considerable pain, but, on the twentieth, began to lose his appetite, became drowsy when undisturbed, and languid when forced to speak or move; his pulse was rapid and small, his nights were passed in confusion.—On the twenty-second day, he complained of more than usual pain, of slight vertigo, and of nausea; and these symptoms succeeding a night of confusion and delirium, in which he struggled often to get out of bed, made it necessary to perform straightway an operation so obviously necessary, which had indeed been resolved on, and delayed only by necessary arrangements. The crown of the trepan was applied twice, and through each perforation the lever was introduced, and the bone poised up, but could not be safely moved till the third perforation set it quite free, when all the blackened bone was taken away.

But long before the operation was performed, the fatal inflammation had begun; so it appeared from the depth and extent of the fatal abscess, which had indeed destroyed one entire hemisphere of the brain. Hitherto his state might rather be described by the term drowsiness than stupor: but the delirium of

the night preceding the operation was a decisive and fatal sign. This delirium never ceased: in the present, as in all cases that I have watched, the symptoms were aggravated during the night. In supuration of the brain, every long slumber is followed by a degree of delirium, and the fate of a patient, whose condition cannot be suspected from any symptoms occurring during the day, may be prognosticated from the confusion in which he passes the night. Through the night following the operation, our patient started up frequently, struggled to get out of bed, talked incoherently, but the return of light restored his senses, and during the day he was rational and composed, but still he slumbered. This was his condition during the nine days that he survived the operation. His pulse was a hundred and twelve, weak and variable; he was restless and confused during the day, especially after slumbering, and was delirious during the night: from the opening in the skull, there was a considerable oozing of blood and of bloody serum. The third and fourth nights after the operation were less perturbed: during the fifth and sixth, he was extremely restless and agitated, speaking much, and struggling to get out of bed: the dura mater appeared now black and sloughing, with a foetid, thin, and blood discharge. On the seventh, he became comatose; his cheek had a circumscribed and hectic flush; his pulse beat 120; there was no more delirium, he lay insensible, and passed his urine and fæces unconsciously. On the sixth, seventh, and eighth days, the coma became deeper; he lay still, and muttering; and, after slight convulsive rigors, expired, on the ninth day after the operation, the twenty-eighth from the time of

his fall. In describing deep suppuration of the brain, to speak of the laxatives and draughts that are administered, or of their effects, were a very trivial detail.

On dissection, the whole of the right hemisphere of the brain was found in a state of suppuration; the basis of the abscess was very large; the opening through the dura mater was like that made by a large abscess lancet into the sac of any great tumor: the medullary substance of the brain was soft and gelatinous; the part immediately surrounding the abscess was gangrenous, marked by a black or leaden colour, extending an inch or more round every part of the abscess, and terminating in a disk or halos of a deep green colour. The left hemisphere was also, in a degree, tainted with the same colours, and slightly ulcerated on its surfaces.

Seventhly. Punctured fracture is that form of wound in the bone which has the same relation to these wide fractures and broad depressions that the stab of a bayonet has to the cut of a sabre: plainly and indisputably requires the trepan, for in no case can we divine how deep the point may have gone; how far the ball, weapon, or point, may have sunk into the brain; in what degree or form the bone, especially its inner table, may be fractured: blood is often extravasated, and often spiculæ stick in the dura mater, or in the sinuses. The present injuries are sufficient motives for applying the trepan, and caries is in this form of fracture almost inevitable. I hold it to be the duty of the surgeon in all such fractures to use the trepan; to place the centre-pin of his instrument as close by the centre of the fracture as its irregularities will allow; and to operate

with a crown so large as to cover all the fracture, and cut it out at once.

Such cases remind me of the necessity of establishing this as a rule, "That all punctured fractures should be trepanned," and of enumerating the general accidents by which they are produced*. When a man falls backwards against the sharp corner of a stove or grate; when, by the bursting of a fowling-piece, either the fragments of the gun-barrel, or the

* The melancholy consequences are admirably depicted in the following singular cases, where the fracture was so minute that, had the integuments been fully opened, it might have escaped investigation; and yet the cutting out of such punctured piece of bone early could alone have saved the boy's life.

—— Brand, aged about 14, was struck on the temple by a pair of scissors flung at him, the point of which stuck a little above the external canthus of his eye, till it was pulled out. A bit of sugar tied on the wound by his mother stopped the blood. He complained little for two or three days; but the pain gradually increased every day after. However, he went about till the eighth day, when he fell into convulsions, and I was sent for.—There was a hard tumor under the pericranium and crotaphite muscle, so tense that a fluctuation in it could with difficulty be perceived. The tumor lay so exactly under the artery, that it could not be laid fully open without wounding the artery. To prevent an hæmorrhage, therefore, I cut the artery and all through to the bone with a bistoury. About half an ounce of well-conditioned pus rushed out, by which he was greatly relieved.—When I thought enough of blood had been discharged, it was easily stopped by a dry dossil and a halfpenny in the compress.—Next day he was brought to town; and Dr. Gilchrist ordered such internal medicines as were judged proper for him, and he continued easier for two or three days. After which the violent headache and vomiting returned, and lasted two or three days more, when a large quantity of matter burst out from within the skull, which again gave some ease.—But, though the orifice in the integuments was enlarged, no further discharge could be procured. He died in a day or two after, being the sixteenth day after the accident.—On opening his head, half a pound of pus was found in the brain, and the hole in the skull made by the scissors would not admit the point of a pin.—His friends absolutely refused the trepan, by which he probably might have been saved. His death, however, was of use to others, who more readily submitted to the operation, upon seeing the fatal consequences of neglecting it in his case.

breech-pin enter into the forehead ; when, by a blow from a hammer, from the keys of a crane swinging and hitting the head ; when, by the blow of a sharp-pointed stone, making a radiated wound of the skull, depressed in the centre ; when a splinter from a caronade, or bolts, nails, or other fragments of iron have, in a sea engagement, penetrated the skull ; when a musket-ball, a dagger's point *, or the point

* In p. 16 of Marchetti, there is an interesting case of a man who had been wounded with a dagger. "He was apparently-cured, a sort of cicatrix was formed ; but all was not sound below ; for in about three months after, he began to have epileptic fits ; and he had his fits about two or three times every month. Sala, who was in the consultation with Marchetti, asked him, whether he had ever had a blow on the head ? He told the story. Then, a probe being introduced under a sort of scab, which was in place of a proper cicatrix, they found a fistula, leading to the bone. The opening was dilated with the knife. Next day the trepan was applied : a yellow ichor flowed out from the dura mater ; it was filled up with florid granulations. In thirty days he was cured, and the epilepsy never returned."

"A few days before the battle at Worcester, while we were dressing the wounded soldiers, one was brought to us shot with a musket bullet on the right side of his head. My servant Will. Clarke, now dwelling at Bridgenorth, in dressing his wound, felt the shot sticking deep in the skull. I hastened to him, and saw the man speechless. We laid the cranium bare by a circular incision, and permitted it to bleed : then passing in a levator, we raised up the bullet, and pulled out the depressed bones, with which there came away some blood, and a little of the brain. This being wiped away, there appeared a large wound in the dura mater. We dressed it with a sindon dipt in *ol. ros.* and *resina*, and filled up the cavity with dossils of lint. Having so likewise dressed up the trepanned bone, we applied our digestives to the lips of the wound, with *emp. è bolo*, and bandage over all. Before we had dressed him up, he lifted up his eyes, and asked how he came amongst us. Several other things he demanded of us. We caused him afterwards to be removed, and continued our care of him. The wound did digest, and somewhat of the brain came away each day ; yet his speech continued : but what became of him after our defeat, I do not know.—WISEMAN, p. 148.

Bartholine tells us of a man in Pavia, who being wounded behind the ear with a sword, the point stuck in the bone. He remained at Pavia some months. It would appear that the surgeons had made many attempts, but surely they must have been irresolute

of a pike or bayonet, stick in it—the fractured bone, and the fragment of the weapon or the ball, must be cut out with the trepan, else, slightly as the patient feels the wound, he will, by the inflaming of the bone and the suppuration of the dura mater, be irrecoverably lost, before the symptoms indicate danger. These are almost the only fractures in which I think the largest sized trepan should be used.

Shocking as the accident was, which I am now going to relate, I hardly ever saw a punctured fracture that I would so willingly have left to nature as that of Billy Cameron, a boy of about twelve years of age. He was occupied a whole morning, with his little playfellows, in swinging upon an area door: the staple was loose; the insecurity of the door made a part of the pleasure they had in swinging upon it. When it came round to this little boy's turn, the stone in which the staple was socketed gave way; the gate of cast iron, the corner-stone, and the boy,

ones, to take it out. He left Pavia: he died of it. But how long he lived with the point of the sword sticking in his skull, Bartholine did not know. Vestingius told Bartholine another singular instance, somewhat of the same kind, of a woman who was wounded by her lover (out of jealousy upon the entering of a rival into the chamber) with a dagger, the point of which stuck in the skull: but this woman recovered; for though they could not at first extract the point of the weapon, yet, after some time, the wounded part of the cranium gave way of its own accord (probably by suppuration and caries); the point of the dagger loosened, and they got it drawn out with forceps. And J. Dom. Sala told Bartholine, That he had even seen a person live, with the point of a sword sticking not only in the bone, but in the substance of the brain itself, who enjoyed tolerable health, except that he had frequent epileptic fits. But how they could allow a man to continue in such a dangerous situation, with the point of a weapon plainly sticking in the brain, with epileptic fits, and exposed of course, upon the slightest irregularity, to be seized with paralysis and convulsion, and so to die, amazes me. Why, if it had been a thorn sticking under the nail of the great toe, they should have cut it out.

tumbled all at once into the area. A good woman ran out instantly to lift the boy, and found him lying with his head pinned to the ground, betwixt two of the iron pikes, one of which had grazed and wounded the left side of the head, while another had pierced the skull, and was sticking in the parietal bone, the weight of the gate and the stone lying above him. She carried him in her arms into her house, where he lay without a sigh or a struggle, cold, pale, and death-like, for ten minutes ; he then began to draw long breaths, to groan, and to open his eyes ; when his elder brother passing, and hearing of the nature of the accident, went into the house from a common impulse of humanity, and found his little brother in this mangled condition. He called a sedan chair, and placing him on his knee on pillows, brought him to the Infirmary.

By the time his father and mother had arrived, he was quite collected, and in his senses ; he was sitting up. While his head was shaved, his mother took him upon her knee, and soothed him ; he laid down his head upon her bosom, and cried, but he wiped away the blood carefully and nicely with his handkerchief ; was perfectly collected and obedient, and neither cried nor struggled. The wounds were, one upon the left side, slight and superficial, from the grazing of one of the pikes ; another in the right temple, or rather about the centre of the parietal bone, very deep. The punctured wound of the integuments admitted a probe, which, passing obliquely backwards, encountered the edge of a deep depressed fracture. The iron point had not directly pierced the skull, but crushed and burst through the bone obliquely,

and, by a lateral pressure, it had so bent down a piece of the skull, that the fracture was long and the depression broad; but the integuments were only slightly wounded, they were punctured, and not torn. The boy was in his perfect senses, without even that tremor or agitation which such an accident might occasion; no weakness of one side; no stupor; no vomiting; no dilatation of the pupil; no slowness nor pausing of the pulse, such as usually accompanies effusion of blood. I was averse from the proposal of opening the integuments, and ventured to prognosticate the worst consequences if a fracture, already so extensive, was trepanned, and the bones torn away. But the boy, though there was not the shadow of an ill symptom, was trepanned; a long incision was made; the crown of the trepan applied; the two pieces of bone, each half an inch broad and an inch long, were twisted and pulled away; two smaller fragments were loosened and pulled away by the help of the levator and forceps; all, in short, that was depressed was disengaged and separated; and the boy, whose condition was after the accident doubtful, lay now in a most perilous state: the integuments cut up to the extent of three inches; the skull opened to the same extent; the dura mater left to sustain alone the force of the arterial pulsations; the brain already protruding, even while the dura mater was still entire. I never, in boys, find the dura mater capable of supporting itself; wherever the openings are thus wide, it inflames, sloughs, gives way at one or more points, and the proper substance of the brain, previously suppurated and ready to form a fungus, protrudes; so it was in this

case ; fungus of the brain took place, with ulceration of the substance of the brain, and he died, with the usual symptoms.

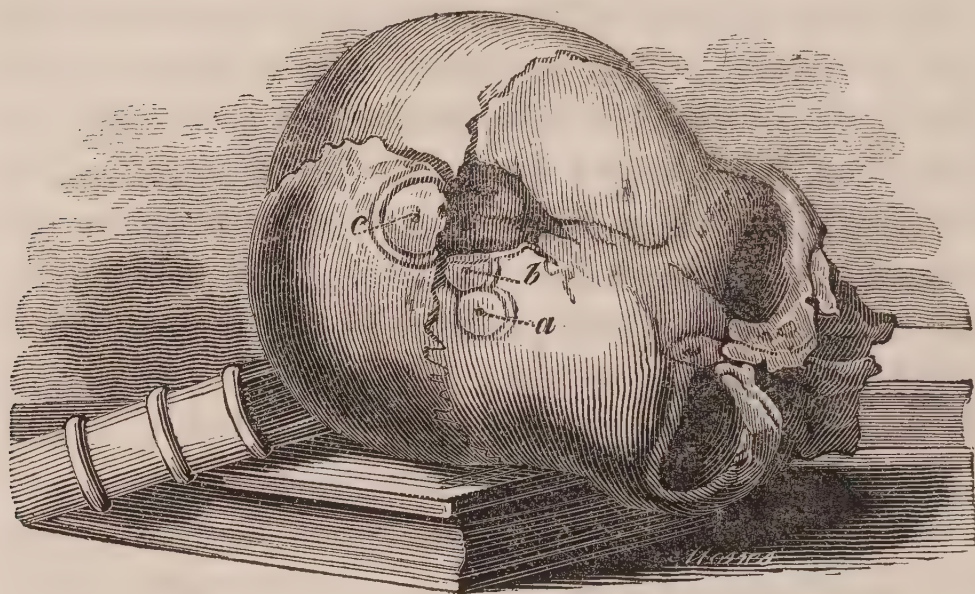
Eighthly. One principle, relating occasionally to every form of fracture ; to the depression ; the angular and fractured wound of the skull ; the mere rima or fissure ; nay, even to the slightest bruise of a bone, is this—that every such fracture is apt to become carious. When, by carelessness or design, a fracture has been quite neglected, or imprudently treated ; when, along with a fracture or fissure, the skull has been grinded and bruised by a carriage wheel, or grazed and deadened by a musket-ball ; when the wound and the exposed bone have been much neglected or much tormented, by the ignorant surgeon, the fractured part becomes carious ; that is to say, it becomes a dead portion : when the wound becomes pale and flabby, the bone still seeming to the touch of the probe bare and rough, or in part exposed, yellow, duskish, or inclined to blackness ; when the patient sickens and becomes languid, with a furred tongue, a hot skin, and a febrile pulse, and a corded feeling within the head,—let the surgeon no longer show his humanity or skill, by watching his patient, but make haste to perforate the skull ; if he perforate early, he will find but a little cream-coloured pus upon the dura mater, which will granulate and reunite with the inner surface of the skull ; but if he wait but three days, the ulceration will affect the brain.

Let this, qualified with such exceptions as your own good sense and experience may suggest, be your rule of practice. It is not by neglecting depression, which never is in itself hurtful, but by disregarding

a carious bone, and the slight but mortal signs of internal suppuration, that many patients are lost. A little boy, L—— D——, of the age of Cameron, in going to school, was crushed betwixt a cart-wheel and the wall, thrown down, mangled, and carried home with a wide and lacerated wound of the scalp, and a very slight depression of the bone. The integuments were lacerated and turned back, so as to display an inconsiderable fracture and slight depression in the fontanel, where the coronal and sagittal sutures cross; the wound was but slightly lacerated, the fracture by no means desperate, and the depression harmless, for the boy was composed and perfectly calm. The integuments were cleaned and replaced; and for three weeks the boy enjoyed perfect health, the wound granulating and appearing to heal. All along, his danger might have been prognosticated from the state of the wound, for though it granulated it did not heal; the lips were florid, but separate; the lower surface was quite detached from the skull, the bone rough, and the edges of the fracture, rough and carious, encountered the point of the probe. But in the fourth week his danger was declared, and the affection of the brain begun; he was feverish, had acute pain in the head, had frequent startings and aguish shiverings, and passed his nights without sleep. Not only was the state of the wound overlooked, and the first signs of internal suppuration disregarded, but though, on the twenty-eighth day, his headaches were aggravated, though he was seized with convulsion, became paralytic of the left side, and his pupils were dilated, no anxiety was excited even by these decided signs of suppurating brain; he was immersed in the warm bath, had a glyster

administered, and, to revive him from this debility, had occasionally a little port wine! Two days had the boy lain in this condition, before the fracture and wound became a subject of attention; then the scalp was, by cutting a few bridges of adhesion which retained it, thrown back, the skull was again uncovered as at first; a fracture, with slight and general depression, was plainly perceived; but a much more dismal appearance, in my opinion, was the blackness of the bone, which, in all the depressed part, and to some extent around it, was now discoloured.

Though the child had long been distracted with severe pain in the head, had been struck with palsy, accompanied with occasional convulsions, and now lay oppressed, with a dilated pupil, it was with difficulty the surgeon was prevailed with to look upon him with any degree of interest; at last, he was induced to perform the operation of trepan, but with what views I never yet could comprehend. The case plainly required the cutting out of the carious bone; under that surely lay the pus; but, to my utter surprise, I saw the crown of the trepan applied at a considerable distance from the depression, manifestly with the purpose of applying the trepan, first, upon the firm bone, and then introducing the lever by that hole, and raising the depressed part! though unquestionably a part, thus slightly and generally depressed, was sufficient to bear the instrument. A part thus blackened with caries should have been cut out, and not sound bone trepanned to spare that which was diseased; and surely whatever matter was to be found, the surgeon had reason to expect under the carious part; for the caries, being the cause of such abscess, must have been the centre or focus of



it. In compliment to the rules of surgery, and in contradiction to plain sense, the perforation was made at a distance from this depression, over which the lever, when introduced, had not the slightest power. Next was made another perforation (b), which approached a little more boldly towards the depressed part. The first perforation (a) was actually at the distance of two diameters of the trepan from the edge of the fractured and carious part; the second crown of the trepan was placed at (b), betwixt the first perforation and the fracture. Both the perforations were made in the sound part of the bone, which bled in the vascular skull of a boy as the gums do when scarified, and over the sound part of the brain, so that not a particle of matter flowed. This second perforation, though in contact with the fracture, was as unavailing as the first in relieving the depression, the sole object of the operation: at last the perforation (c) being made upon the coronal suture, near the vertex, and through the carious part of the bone,

the matter spouted out, and the operator and his assistant eyed each other with a smirk of exultation at their success, perhaps of congratulation in having lighted so accidentally, so fortunately, upon a cause of danger which they were little aware of. This last perforation should have been the sole object, the beginning and the end of the operation, as it at once gave vent to the abscess, and cut away a part at least of the carious bone. It was, I am sorry to say, neither the one nor the other; tooth forceps and lithotomy forceps were called for, and all the intermediate points of bone twisted and torn away, the trepan holes and the carious depression being converted into one wide and circular opening, as large as the palm of the hand; without any proper fungus having formed, the brain (still covered by the dura mater) protruded in a general way, and soon, by sloughy orifices forming (as in the case of Billy Cameron), a fungus began to protrude, which was duly powdered with alum, till the seventh day, when the boy expired.

The lesson which this case illustrates is one of the most necessary in surgery, viz. the duty of observing the state of the integuments, the caries of the bone, and the first slight symptoms of disordered brain, accompanied with separation of the integuments from the carious skull; the imprudence of making large openings is also conspicuous, and the propriety of trepanning the depressed bone wherever it will bear it, since, while in giving vent to the matter, we cut away the caries; and, finally, I would have you, on every such occasion, not to think merely of vindicating yourself by adhering to the strict rules of art, but to reflect on the use and purpose of your opera-

tion, and to do boldly for your patient's safety those things which sense and experience dictate. Such abscess of the brain often follows a neglected fracture, and requires a trepan to open it, in place of a lancet. These are, I apprehend, the chief rules for the treatment of depressed and carious fractures.

DISCOURSE VI.

ON THE STATES OF CONCUSSION AND COMPRESSION
OF THE BRAIN, WITH EXAMPLES NARRATIVE AND
DESCRIPTIVE.

To treat fractures, wounds, and other open and manifest injuries of the skull, prudently and skilfully, may be thought difficult; but how to reason concerning those internal injuries which are hidden from the senses, and marked only by variable and uncertain signs, must ever be perplexing. Perhaps there is nothing more generally desired by the profession than some decisive marks, denoting the particular nature of that stupor in which a patient lies oppressed after a fall or a heavy obtuse blow. But there is no such sign: we are doomed to proceed in our profession always with a degree of uncertainty, and to regulate our conduct by a perpetual and attentive exercise of our judgment and senses. It is only by a deliberate and calm review of the circumstances attending concussion, that we can arrive at any thing like a conclusion; and, in the course of reasoning, which I am now to lay before you, you will, I trust,

feel the advantage of those general views I have formerly delivered ; for it is my object now to make a parallel betwixt Concussion and Compression, the Apoplectic and the Paralytic States of the Brain ; to establish, in short, the relation of Medicine and Surgery. To be surgeons, you must be physicians ; and, even though educated as physicians, you must still make yourselves acquainted with the details even of that profession which you are not to practise. It is shrewdly to be suspected, that a physician who boasts of knowing nothing of our profession of surgery, knows little of his own.

To reason upon the cause of every phenomenon in the living body is natural and unavoidable, and does by no means contribute either to multiply or confirm whatever prejudices we may have. It is only from refusing to reason that our worst prejudices have arisen ; and prejudices of ignorance are infinitely more dangerous than the prejudices of those who, being willing to reason, are of course open to conviction, and inclined to enter into the discussion of whatever new views or unobserved phenomena are brought to light. Nothing, perhaps, can be more unmeaning than the word Concussion, which is not, in the common acceptation, accompanied with any conviction of the structure of the brain being disordered by the shock ; the term implies a belief that the affection is of the nature usually denominated Nervous ! that it is inscrutable in its nature ! that, as we know nothing of the immediate cause, we can do nothing to recover our patient ! that whatever phenomena we observe, are such as are usually designated signs of debility ; and from this persuasion, and an indistinct and confused analogy (as Mr. Aber-

nethy observes) betwixt fainting and concussion, stimulants and wine, the most dangerous of all medicines, are poured down.

If concussion be indeed this inscrutable nervous affection, unattended with physical disorder, we must become mere spectators ; there is an end of reasoning, and in such uncertainty it were better to refrain from practice. But, the comparing the brain with other parts and organs of the body will bring to our recollection many consolatory circumstances, which will encourage you to believe, that here also our profession may be useful. What does a bruise, a shock, and a general injury, do to a limb ? Does it produce any sort of disorder in a limb, which it may not produce in the more delicate substance of the brain ? When a man is hurt by the oblique blow of a cannon ball, or has his thigh bruised by riding furiously against a carriage, by a fall, or by a log of wood, a block of stone, or any heavy body falling upon him, what does he feel ? Nothing but numbness : the part is torpid ; he hardly knows how much he is hurt ; he is lame ; and we can hardly believe that any internal or physical disorder has taken place so suddenly ! yet, before he is recovered from his confusion, or is able to mount his horse, the limb is stiff and swelled ; the swelling increases every moment ; the suffusion of blood, under the transparent skin, shows, by the speedy discolouring of the part, that the swelling (too sudden to proceed from increased vascular action) proceeds truly from blood extravasated by the ruptured vessels, and there is no reason to doubt that the swelling in the deeper parts is from the same cause. The vessels of the limb have given way in many parts ; its cellular substance is choked with

blood. If the suffusion be so universal and so great as to suffocate the arterial action, the limb never recovers, all living action stops, it gangrenes and dies. If the blood be injected in such a degree as to create only pain and disorder, the arterial action is rather excited, and heat, pain, redness, and suppurative inflammation take place. If the blood be less generally injected into the limb, it is more easily absorbed, and the swelling is resolved without redness or pain. Of this suite of phenomena I must needs remind you, before proceeding, to observe in what degree these appearances take place in shocks or blows upon the head, and in what degree they are likely to affect the function of the brain.

OF CONCUSSION.

The patient who has fallen from a great height, and lies insensible from the shock, has sustained the principal injury in that system of vessels which, from all that I have related to you, is the most delicate, and the most susceptible of extravasation. Nor is there any mark wanting of extravasation, slighter or greater, general or local, having taken place in the brain. Nervous affection (if we are still to use this unmeaning term) might, for a moment, confound the function of the brain, as a man is not only stunned but sickened by a blow of the fist; but the patient, who has suffered a concussion, lies insensible, snoring, and with his senses oppressed, and is in a state resembling that of apoplexy or intoxication; his forehead is swelled, his eyes often closed, and his features deformed with extravasated blood; blood gushes at once from his nostrils, mouth, and eyes; his pulse is

slow and pausing; his limbs and joints loose and relaxed; the pupils of his eyes dilated; his breathing slow; his whole body cold; you hardly know that he is alive, but by his groans. If blood has thus burst from every part of this system of vessels, is it likely that the brain has escaped? If the blood-vessels of the nostrils, of the throat, of the ears, have burst from the shock, and blood is also effused under the skin, is it likely that the delicate substance of the brain should escape the same degree of suffusion? It is indeed true that, when the patient dies, and his brain is dissected in that coarse and slovenly manner which is but too common, and by boys who hardly know its natural colour and forms, it seems as if nothing had happened to account for the sudden death of the patient; and it is confidently reported so, because there is no fracture of the skull, nor any conspicuous effusion of blood: but when a brain thus deranged is dissected by a master who, by judging what is likely to happen, knows what to look for, the phenomena, though little perceptible to an ignorant man, must be interesting to a thinking observer.

A man, says Mr. Abernethy, having fallen from the roof of a brewhouse, a height of at least eighty feet, had his fall broken by touching the ground first with his wrist, which was dislocated and mangled; his forehead next struck the ground, and his face was bruised, but his cranium was uninjured. He lay at first almost inanimate, cold, and with a feeble pulse; when he became warm, he had stertorous breathing, a dilated pupil, and a profuse perspiration; his pulse rose to 140, he recovered a degree of sensibility, his pupil contracted, and his eyebrows were drawn into a frown; but his pulse again

subsided ; the animal functions gradually failed ; he died the following day ; and his head was dissected by Mr. Abernethy, who reports the state of the brain in these words :—" On dissection, there appeared every mark denoting violent inflammation of the brain and pia mater, of short duration. The minute arteries of the pia mater were turgid with blood ; in many places there was the appearance called blood-shot, which was also to be seen in the lining of the ventricles. Dark-coloured, and in some places bloody, coagulable lymph filled all the recesses between the tunica arachnoidea and pia mater. On dividing the substance of the brain, all its vessels appeared as if injected with blood."

Every word of this report (more impartial than any I could relate on my own authority) conveys the idea of turgescence of vessels, and general cellular effusion throughout the whole substance of the brain, and makes good the parallel betwixt that state designated by the term concussion of the brain, and the benumbed and torpid condition of a limb whose arteries are burst and cellular substance suffused by a blow. It is not possible to imagine circumstances more suited to support the parallel than that suite of phenomena which takes place in concussion. Recollect fully the doctrine I have formerly laid down, and you will comprehend at once all the phenomena which distinguish concussion from compression of the brain. " Every cause which affects the brain universally through all its parts, as turgescence of its vessels, or general suffusion of its substance, interrupts and disorders its functions ; while a partial compression, as that proceeding from depressed bone, extravasated blood, or any thing external to the brain,

affects its functions very slightly, unless the compression, though local, is such as actually to cause death." The patient who has fallen from a great height, or otherwise suffered that shock which so deeply affects the functions of the brain, is found, when lifted from the ground, cold, pale, motionless, without pulse, without sense, and is as in a fainting fit ; if he continues cold, and passes his urine and fæces involuntarily, he dies. The first signs of returning life are deep and oppressed groans, the cold sweat breaking on his temples, and a fluttering motion in the pulses ; when laid in bed, when warmed and restored to life, the groans become more frequent, he seems deeply oppressed, he tosses his limbs from time to time ; his face is flushed, his nostrils dilated, his breathing laborious and noisy, his pulse slow and heavy, and he has all the symptoms of deep apoplexy. By the second day his pulse has risen to 120 ; his lips are parched, his skin dry, his eye more open ; he stares wildly, but is insensible ; and being roused, he, after a short and confused struggle, and muttering, as in low delirium, falls down again into a heavy slumber, from which, if bled and purged profusely, and his head bathed with cold vinegar, the surgeon having the good sense to refrain from giving opium or wine, he gradually recovers. It would appear, from this series of symptoms, that whatever general effusion takes place in the moment of the shock, is slowly absorbed ; and that the febrile inflammatory action, which such a state of the sensorium excites, in the days immediately succeeding the fall, is harmless. Yet not unfrequently there is a true Typhomania ; the pulse rises higher, and throbs powerfully ; and the patient, after long tossing and oppression, starts

from his bed, strikes and struggles with his attendants, and subsides again into a state of torpor ; but by profuse evacuations, and bold prescriptions, escapes the danger of an inflamed brain, though the action sometimes terminates in continued insanity, followed by imbecility.

These successive states, first of coldness and stillness in all the vital actions, with oppressed brain, and next of high arterial action, accompanied with delirium, have always struck me as intimating strongly the parallel (so natural in every other point of view) betwixt a contusion of a limb, or of any other organ of the body, and concussion of the brain. Nor am I over anxious, when I find my patient quite insensible, lying in a state of stupor, resembling intoxication, if that first stupor be followed by arterial action and the signs of inflammation, for then I know the oppression is from no local cause ; nor am I alarmed when he becomes delirious, for that is a state little more than febrile, which I have usually observed to be a sure forerunner of recovery ; there is in such case nothing essentially to oppress the vital functions, or to cause death.

OF COMPRESSION.

When, in place of general suffusion and disordered circulation, some greater vessel has given way, and either under the dura mater, or in the substance of the brain, there is a particular effusion of blood, the scene is very different from that now described. The patient, oppressed by an effusion of blood, is never insensible (unless he is about to expire), and rarely delirious ; his pulse never rises, but is slow, heavy,

and pausing at every fifth stroke ; his pupil is sometimes dilated ; his one side usually paralysed, or at least still and motionless, while the other often shakes with a sort of tremulous convulsion, which returns at regular intervals, and is attended with a quivering and irregular pulse, cold extremities, and insensible evacuations, when he is about to expire.

Extravasation more frequently arises from a blow or fall upon a hard body, and is more connected with fracture of the skull than concussion, which arises rather from a shock than a blow. Extravasation is more of the nature of a local injury ; the patient, when raised up, is cold, pale, and motionless, but to this no usual heat ensues ; he tosses as under some oppressive feeling, and often lifts his hand towards the injured side of the head ; he lies with his eyes shut, groans as from oppression, but is always sensible ; stares at you when roused ; answers whatever questions you ask rationally, but in monosyllables ; he seems impatient when teased with questions ; his answers are pronounced with a sigh or a groan ; he is correct in answering to the circumstances of his fall, even to the nature of the oppression he suffers, and to the part of his head that is pained, towards which he moves his hand, though irregularly, whenever he is desired ; in his tossing he sometimes rises upon his elbow ; when requested to rise, he sits up, and takes the drink which he calls for, but soon sinks down again into a slumber liker sleep than apoplexy, and tosses and groans more as his sleep becomes deeper. The oppression and tossing are inseparable from this condition of the sensorium, and the pulse is slow, pausing, beating no more than fifty in a minute, and interrupted at every fifth or sixth stroke, espe-

cially while the patient is lying in deeper slumber, or when in particular danger. I believe I have rarely seen a patient, to whom operation or any kind of assistance could be useful, quite insensible from mere oppression of extravasated blood; and of this I am very sure, that I have innumerable times seen the patient whose extravasation was so great as to prove fatal, such as was found upon dissection to cover one entire hemisphere of the brain, retain his perfect senses, and recollect minutely the circumstances of his fall, with a consciousness all along of every thing that was said or done about him.

I have just described a condition which, I would fain flatter myself, can hardly be mistaken, which, at least, is not likely to be confounded with the total stupor of concussion. In the first degree of extravasation, the person lying oppressed with extravasated blood is not insensible, but tosses and groans from oppression, replies when spoken to, feels giddy, and, when able to express his feelings, says that every thing seems to turn round; he pukes from time to time, and has a slow, heavy, and pausing pulse. If you add to these signs, that, in his tossing, you perceive that one leg or arm still moves, while the opposite arm and leg lie almost still and motionless, you will seldom be deceived; and finding these symptoms to continue for days, the oppression to become deeper, the vomiting to cease, and the pulse to decline in strength, becoming slower as it becomes feeble, it is your duty to apply the trepan, and often you are successful. These are the signs of slighter extravasation, which yet, without the assistance of the surgeon, becomes desperate; for, in a few days, the side opposite to that which received the blow

becomes manifestly paralytic ; and as the extravasation and oppression of the sensorium increase, the palsy is followed by convulsion ; while the one side becomes paralytic, the other is seized with slight tremors, and soon after the pulse becomes weaker, though it can hardly become slower, the natural heat declines, the patient expires. Wherever such convulsion accompanies the palsy, it is too late to operate.

In the second degree of extravasation, when the patient is paralytic, or completely oppressed, from the first moment, and there is no perceptible interval betwixt the paralysis of one side and declining of the vital powers ; when he lies oppressed and moaning, raises his hand frequently towards his head, but is not deeply insensible, nor has the pupil much dilated ; if he speaks, when teased, though slowly and difficultly, and then in a particular manner raises his hand to his head, the evidence of extravasation is complete, the patient is in the utmost danger, the operation should immediately be had recourse to, and perforating with a large trepan, and giving vent to the coagulated blood, which rolls out thick and black, sometimes relieves the palsy, restores the senses, and finally saves the patient's life.

But there is a third degree of extravasation, invariably fatal ; and I believe the symptoms I am now to describe indicate, in general, that extravasation which either expands itself over the lower parts of the brain, or extends from the upper parts to the basis of the skull, raising the nerves from their origins and distending them betwixt the basis of the brain and the foramina through which they pass out. The condition I have here to describe is that of total in-

sensibility and grinning convulsion ; an insensibility unaccompanied by stertor or snoring, but, on the contrary, with a pale face, cold extremities, and a fluttering pulse ; a convulsion agitating not one side, but chiefly affecting the features of the face, jerking the head back, and stiffening the neck. The convulsion resembles that of the locked jaw ; and it is very distracting to look upon such a patient, for the symptom brings an absolute conviction to the mind of the spectator that the disorder is fatal.

The patient's condition may be thus characterised : he is taken up cold, insensible, with a dilated pupil, and hardly any signs of life, and recovers heat very slowly and imperfectly ; after lying oppressed, groaning, deadly pale, with a dilated pupil, the extremities cold, and the eye-lid remaining raised as you open it, unless you lay it down again, he begins on the second day to be affected with convulsive twitches ; the cheek is particularly distorted, the whole body is still and cold ; the convulsion increases in violence, and returns with a degree of regularity every ten minutes or quarter of an hour ; at each return of the convulsion he continues, while you can count two hundred or more, to have the cheek and corner of the mouth raised, the eye-brow, and all the features of that side, violently distorted with spasmodic twitches, the neck rigid, the head jerked violently round and bent backwards upon the neck, with interrupted strokes ; and each convulsive twitch is accompanied with a catch of the respiration, a distortion of the mouth, and with a noise of hick ! hick ! repeated at each twitch, while the convulsion lasts. It seldom continues long. On the third or fourth day the convulsions grow weaker, the extremities, and the whole body, become cold ;

the pulse, which is not at all to be felt during the convulsion, trembles during the intervals, and the patient expires.

These two states of concussion and compression bear a strong analogy with the relative states of apoplexy and palsy. Concussion, there is every reason to believe, is not a mere nervous affection, else it could not be permanent ; but a suffusion into the substance of the brain, resembling the ecchymosis or bloody suffusion of a bruised limb, attended with symptoms resembling apoplexy, and terminating usually in a gradual absorption and slow recovery ; sometimes in high inflammatory action and sudden delirium, in Typhomania, or rather that alternation of Delirium and Coma, which is almost inseparable from such a state of the sensorium. While compression, proceeding from extravasation of blood, is plainly palsy ; beginning in stupor, without insensibility, and ending in Hemiplegia and convulsions : but, with this special distinction, that palsy, proceeding from rupture of vessels overcharged by the apoplectic arterial action, is a disease of the brain itself, is attended with destruction of the cerebral substance, and is thence incurable ; while the Paralytic State, proceeding from a shock or blow, consists in extravasation, foreign to the substance of the brain, external even to the dura mater ; is merely a local compression, not directly injurious to the cerebral substance, and thence is curable ; the moment the extravasation is let out, the patient raises his eyes, knows his friends, and moves the affected side. The truth or probability of these parallels will best appear from some sketches and narratives of such accidents as you are likely to meet with in practice.

Being called to Hamilton, to visit a gentleman, an officer in the 7th Dragoons, who was supposed to have a fracture of the skull; I found that, in riding a wild horse, in the court-yard of the barracks, unaccustomed with the heavy bit of the cavalry equipage, he had checked his horse in rearing, and pulled him back, and the horse falling upon him, he was knocked down and struck to the ground with great violence, his occiput encountering the hard beaten gravel: he lay pale, pulseless, and insensible, was restored to heat very slowly, and continued in a profound stupor, snoring and motionless. I arrived the following day, and found him still insensible; his pupil not dilated, his tongue furred, his hand hot and dry; his pulse high, his face flushed; his looks, when roused, wild and distracted; he instantly, after being disturbed, fell down again into a state of stupor, and nothing could rouse him to any recollection of his situation, nor enable him to articulate even a monosyllable. Upon consulting with Mr. Taylor, the regimental surgeon, formerly of Mercer's Hospital, a man of the best education, and of strong good sense, we agreed, however unpromising his condition might appear to his friends, to report to Colonel Heul, that he was in no danger; that we should make no incisions; that, by profuse evacuations, this fever might be prevented from rising to delirium; that, after slumbering a few days, he would gradually recover his senses. Presuming, from this infallible mark of quick pulse accompanying the stupor, that the stupor was void of danger, I left him with confidence; and, by letters from Mr. Taylor, had the comfort to learn that, after slight dawnings of sense and reason, he

was, by bleeding and strong purges of calomel and jalap, perfectly restored, before the week had elapsed.

Concussion, in a greater or less degree, is almost inseparable from that kind of shock to which the head is exposed when a man is thrown from on horseback ; sometimes it is accompanied with fracture or extravasation, and thence questions of great delicacy and difficulty often arise. The first head I ever dissected, after an accident of this nature, was that of a young gentleman, who having rode on a pleasure party to Roslin, exceeded in wine, was ill able to manage his horse, was thrown, and died on the fourth day. But in his skull was found not the slightest trace of fracture, nor within the slightest extravasation ; nor could any peculiar appearances be remarked in examining the substance of the brain itself, except general redness of the pia mater, vessels extremely turgid, and many bloody points. Whence we perceive how narrowly those escape who have violent concussion ; they almost invariably die, if the pulse continues low, or is at any time intermitting.

Another young gentleman, on his return from a like excursion, was thrown from his horse, lay in a death-like stupor for ten days, during which period the blood, which had at first gushed from his nose, mouth, and ears, continued to flow unremittingly from his right ear. The shock, which thus bursts the vessels on these delicate surfaces, cannot but have a like effect on the delicate cerebral substance within. The senses and intellect suffer from this suffused state of the brain, but the hæmorrhagy from these vessels probably saves the internal part of the system from any extreme violence ; at all events, it

is certainly observed, that such issue of blood from the mouth and nostrils, though a sign of great violence, is favourable to the patient's recovery; and if any such hæmorrhagy is dangerous, it is that from the ear, for there is little doubt that it must come from those internal vessels which traverse the ear. Yet this young gentleman entirely recovered.

In such cases, wine and the heat of exercise, youth, and health and strength, prepare the vascular system but too well to assume an inflammatory action, and to re-act powerfully; thence it often happens that, in place of lying like these young men, torpid and oppressed, the patient bursts out of bed, struggles with the attendants with maniacal strength, and is very difficultly subdued, and in great danger of ultimate violence to the structure of the brain from such high and continued vascular action. This I saw conspicuously exemplified, in a young man, uncommonly athletic, accustomed to violent exercises, who, being thrown from his horse when riding extremely hard, not brutally intoxicated, but furious with wine, lay for five days in a state of profound stupor, from which he, after staring, struggling, and muttering, awakened to such a phrensy that four stout men with difficulty held him down in bed, and yet he recovered, and reformed, and now lives in perfect health.

These familiar examples, such as you will daily meet with in practice, cannot perhaps be more happily closed than with a short case from Jacotius; it stands recorded in his commentary on the third aphorism of the first book of Hippocrates. "We have observed," says this author, "of those who have the brain injured, some dying suddenly, others lying oppressed and snoring, while others have blood issuing from the nose, ears, and mouth, and yet live. One

patient of mine having lain speechless a long while, and apparently dying in convulsions, started suddenly from his bed, in the middle of the night, fell upon the attendants with maniacal fury, and felled every mother's son of them to the ground, except a Franciscan monk, a lusty able fellow, against whom he maintained a long battle, with feet, and hands, and talons: the monk called loudly for help to those who were already felled, but in vain; they lay strewed on the ground, while he struggled alone with the furious patient, who seized alternately clubs, fire-irons, piss-pots, whatever he could lay hands on; and laying hold at last of an iron stanchel, he tore it from the window with incredible strength. He had now nearly levelled the monk with his fellow watchers, and would have beaten out his brains with a stone of forty pounds weight, which he lifted and aimed to throw at his head, when the monk, breathless and exhausted, but desperate, collected all his strength into one last effort, and gave him a kick on the cods, which brought him to the ground. This man, says Jacotius, I entirely and perfectly cured*." This example of horrible phrenitic delirium, I quote in proof of what

* "Nos observavimus, quibus cerebri partes sauciatae essent, alios repente mortuos: alios soporatos cruentatis etiam auribus et naribus diu mansisse, tandemque evasisse: quendam Arelate, cum diu obmutuisset, crebrisque convulsionibus prehensus supremum, ut videbatur, diem conficeret, subito è lecto noctu exilientem, ac furore percitum in eos, qui aderant impetum fecisse, prostratisque aliis, cum Franciscano valente et nervoso, diu pugnis, unguibus, calcibus certasse, quem frustra caeterorum opem implorantem, ita miseris tractavit modis, ut arrepta primum cruce, dende matula, fuste, ferro etiam incredibili vi è fenestris detracto, hominem non sine ejulatu penè oppresserit: ac certè sublato lapide quadraginta pondo, tandem oppressisset, nisi Franciscanus in summa desperatione collectis viribus ictum gravem aëri pudendis imegisset, quo ille humi concidit. Hic tamen praeter omnium opinionem nostris auxiliis adjutus tandem convaleuit."—Jacotius Comment. ad aph. 3. lib. 1. sect. 3. Coac. Hipp.

I have constantly remarked, that delirium is the least unfavourable symptom and the most curable.

The more fatal accident of extravasation is attended with symptoms less terrible, and with a comparatively slight affection of the intellect and senses : I have been confounded often to see the patient recollected and sensible, under a compression so decisive as to cause paralysis of one side : somnolency, not stupor, is truly the mark of this state.

John Hutchison, a sailor lad, of twenty years of age, fell down stairs, and lay in a state singularly characteristic of compression of the brain : His condition was described to me by a good woman, who was very careful of him from the moment of his fall, for he was the companion of her son, who had followed him to sea ; when the one boy was gone abroad, the other would not stay at home. This lad, on a visit to his father, perfectly sober, going negligently up an outside stair, fell, but whether three steps as a workman reports, or the whole flight as this woman's husband believes, we could never certainly learn. This good woman, who lived in the house under his father, was abroad at the time, but her husband heard the fall, so violent was the shock, and running out, carried him up stairs with the assistance of a mason who was working in the close. When she came home, she went up to him, and found him lying oppressed, as in a deep sleep ; she asked him often what happened, and how he was, which he answered always in two or three words, passionately and impatiently pronounced, "that he was better," "that he would soon be well," "that he would lie and sleep a little," still he begged that they might let him lie still and sleep. His tongue sometimes

faltered ; he answered best when most roused ; there was a cold sweat all over him ; his face was exceedingly pale, he yawned perpetually, and always when offered drink, &c. cried, “let me lie and sleep.” He vomited frequently during the two first hours after the fall : his left side, his left arm at least, was plainly powerless, he never moved it in concert with the right : he lay in a slumbering condition, groaning and tossing as if oppressed ; muttering, but always conscious of his condition ; complaining of his head, and able to answer. When this good woman set him up in bed, or when he raised himself to pass his urine, he complained often of his breast and sometimes of his belly, but continually of his head : while quiet he had no snoring, and slept like a child, till after being bled by the surgeon of his ship, from which time he enjoyed no more of that placid sleep. On the third day, this woman brought him up a basin of warm milk, and he seemed to like it ; she raised him in bed, he sat up and took the basin in his own hand, and when she gave it him, saying, Take it my good lad, he answered, “I will, I will, but do not trust to my hand only ;” yet, with her help, he held it to his head, and drank it off. He complained continually of his head ; and in whatever way roused or disturbed, he begged they would let him sleep ; “if they would let him sleep a little longer, he said he would go down to Leith and go on board.”

This good woman went up to see him at seven in the morning of the fourth day ; she found him still slumbering, and continually complaining of his head ; suddenly he was seized with a strong convulsion, raised himself a little in bed, and thumped incessantly with his hand upon the side of the bed, striking with

the paralytic arm as well as with the sound, and all the while he kicked and struggled with his feet; at last his left hand was suddenly seized with a violent spasm, the wrist was strongly bent down towards the fore arm, the fingers stood out rigid at right angles with the hand, and from that moment he never moved that arm more, his hand continuing rigid in this distorted form. But the convulsion did not then cease; it continued from seven in the morning till eight; notwithstanding these terrible convulsions, and this spasmodic palsy of the left hand, he retained his senses, spoke sensibly when roused, supported himself in some degree in bed, complained sometimes of his belly and of his head; and when asked about the state of his bowels from the time of his fall, answered collectedly and correctly. This was on Thursday, the fourth day from the fall: on Friday morning, I saw him, for the first time; and in the evening by six o'clock he was dead.

“In the last day of his existence, he still retained his senses; he lay in a perpetual slumber, but had no puking; his tossing and anxieties were very distressing to see; his face was deadly pale, his right eye stood immoveable when opened, the pupil being widely dilated; while his left (though his left side was paralysed) remained irritable and moveable, the pupil of it was contracted, and it turned quickly from the light; his pulse was small, quick, and fluttering, like that of a sick child; and the vital motions so affected, that it appeared manifestly that they could not go on; his extremities were cold, and I judged him dying: but nothing surprised me more than to find, upon lifting his eye-lid, that I could rouse him to speak; when I bade him put out his tongue, he

did so, and when I spake loud and impressively, and asked where his pain was, he raised his right hand, though in an irregular way, and laid it upon his head."

"This very stout young man expired about six o'clock on Friday evening; and the following evening we found, upon dissecting his head, no tumor, nor even a bloody effusion in the integuments, but in the cranium a large and wide fracture, traversing the parietal bone, and running through its whole length: unconnected with that, on the vertex, was a small fissure, penetrating only through the first table: under the centre of the parietal bone lay a very large coagulum of blood; it was as large as the whole hand, bating the points of the fore and mid fingers, and thicker than the fleshy part of the palm; it was very firmly congealed, and came off in one cake like the placenta of a foetus, leaving a very deep depression in the brain, into which you might have laid the back of your hand."

It is not my intention, however useful it might be, to accumulate authorities for what I know to be a plain fact, or to multiply descriptions of a state of which I have given a sketchy outline in my general description, and which I would preserve clear and distinct: but I cannot refrain from quoting, on my margin *,

* Fontanus relates the case of a boy having extravasation under the skull, in the following terms. "An orphan boy, about fifteen years of age, lost his tame sparrow, which flew away from him and lighted on a wall. The boy tried to entice the sparrow, and, failing in this, began to climb the wall; the sparrow flitted along, the boy followed, till at last he fell and struck his left temple; but he got up; and being asked by his playfellows whether he was not hurt, he fell a laughing, looking up waggishly to the wall from which he had the fall, which was fifteen feet high. He went to school as usual, and at supper he ate heartily, and then went to bed; but, at midnight, he awakened in the utmost terror, vomiting a mixture of

one or two observations, to prove the same important fact of the intellect being little affected by extravasation, even by that which is to be fatal ; while I go on to represent to you the condition of the patient while labouring under symptoms undoubtedly mortal.

bile and blood ; before morning he was delirious. The governors of the hospital were called, who gave him every little assistance in their power. I, being physician in ordinary to the charity, was sent for, and in my turn called the surgeons. They examined, but felt no contusion nor depression of the cranium. I ordered him to be bled, to have a glyster, to have the head fomented. On the following day, a tumor appeared over the place of the temporal muscle ; an incision was made in it, down to the muscle, and we found the skull bruised and fissured in various directions ; yet there was no one piece which could be poised out. The trepan was naturally thought of, but was manifestly unnecessary, as the blood exuded through the fracture: when the free flux of the blood was stopped, we had recourse to the trepan, but with no good effect, for the boy died.

“ Upon opening the skull, besides the fracture and these fissures, we found, on the very opposite side of the skull, two counter-fissures, of a triangular form, the cause of which we cannot pretend to explain. The dura and pia mater were tense as a drum, while the very capillary veins were so turgid that they resembled rather the veins of the hand than the veins of the brain ; and betwixt the skull and the membranes was found much coagulated blood.”—FONTANUS.

“ A coarse athletic man,” says Wepfer, “ in cutting a mill-stone, fell from the gallery where he was working, at no great height ; but he lighted on a beam, and struck the occiput a little behind the ear, upon the corner of the beam ; he lay pale, cold, and speechless, as in a faint, and upon recovering complained only of pain on the occiput where it struck the beam. The beam being large and round, the surgeon found neither tumor nor sign of depression, not the slightest wound ; the pained part could be covered with the flesh of the thumb, and was painful when touched. The surgeon bled his patient, applied his ointments, and put a twisted towel in his teeth, to try, by twanging it, whether there was a fracture ; he gave him hard bodies to chew, and struck with an iron upon his teeth, as surgeons used to do to discover fractures. The patient walked about sometimes, sometimes sat on a stool by the fire ; lay with his head low ; never vomited ; blood sometimes flowed from his mouth ; in walking, he carried his head to the right side, with slight marks of the staggering vertigo (*vertigo titubans*) ; he had slight ringing in the right ear, but he saw well, spoke well, was silent only because it was his way ; slept little, but had no delirium ; ate little, but had no thirst. The pain of the affected part never remitted ; but, with

“A very old man was carried into the hospital, who, after a fall, lay insensible and convulsed ; no relations accompanied him to tell what had happened. Two sons, who afterwards came, were at once brutal and perverse, seemingly indifferent to his sufferings, and yet sternly and impudently refusing to allow us to proceed in the way that prudence and the necessities of the case required. He was a very old man, with bald temples, a naked scalp, and not the slightest appearance of injury on the head : he lay in a deep stupor, immoveable, except when agitated with a convulsion, which returned every ten minutes, and became more frequent as his strength declined ; his eyes, which were closed during the interval of stupor, opened when the convulsion approached, and stood staring wide, with a much dilated pupil : first the cheek and features on the right side of the face were drawn up into a ludicrous grin ; then the neck stiffened, the head was jerked backwards, and the jaws worked backwards and forwards with a violent spasm ; the tongue and throat were also affected, and the lips made that kind of noise that follows when we draw the breath through the closed teeth, to prevent the

such slight signs, the surgeon, although a dexterous operator, could not think of trepanning. From the 25th to the 28th of November, he continued in this condition, when, about six in the evening, being in his entire senses, and with all his bodily powers perfect, he began to breathe with a sort of stertor, as if the bronchæ were clogged with blood or mucus, yet without dyspnœa ; and, about eight o'clock, he lost in a moment all sense and motion, and in a quarter of an hour expired.

“On dissecting the head, there was found a slight depression, with fissure in the occiput, and upon lifting the skull-cap, two long and gaping fissures, and betwixt the dura and pia mater much black and congealed blood, and a proportioned quantity of serum, chiefly about the basis of the brain, extending round the cerebellum to the occipital hole, and round the cerebrum, even to the os frontis, limited entirely to the right side.”—Vide Wepfer, ob. viii.

saliva escaping by the angle of the mouth : after continuing two minutes or more, the convulsion terminated, with deep groans, in a state of stupor. His unnatural sons would not suffer us to touch one hair of his head ; and on the evening of the second day, when he died, they came, with a mob of vagabonds at their heels, and carried away the body, with a degree of precipitation which inclined us to believe that there was something particular in the manner of this blow which they were afraid dissection might reveal."

Not a moment should be lost when such symptoms appear : The extravasation may be in the ventricles, on the basis, or within the substance of the brain ; and if so, the man is gone beyond redemption ; but, if it be only on the surface, and there is a possibility of saving his life, it can be only by immediate operation : when the symptoms of extravasation are accompanied with fracture running downwards towards the basis of the skull, we may despair of doing good.

" A big and strong man, a common labourer, fell down three steps of a stair ; but there was every reason to believe he had struck his head on the edge of a bucket, hitting that part where a projecting iron hinge joins the iron handle with the tub : when raised up, he was pale, cold, and pulseless ; cordials were given him, he was restored to heat, and then blood was observed to distil from his nostrils and right ear. Being carried into his own house, he passed a disturbed and restless night, till towards morning that he enjoyed a calm sleep. He lay still and motionless the second day ; his eyes seemed dead and glazed, the pupils of both were dilated, contracting only with the very strongest light ; his jaws

seemed clenched, his teeth closely shut, his lips retracted and turned backwards, uncovering the teeth as in grinning ; he breathed slow and heavily through his nostrils ; he was paralytic of his left side, had involuntary stools, and passed his urine in the bed.

“ Yet upon being stirred and roused, he looked up wild and bewildered, and had frequently during the night attempted to get out of bed ; his pulse was weak and fluttering, and his body cold ; he was not so insensible but that a purge operated briskly, though then and always his stools past unconsciously : his face was pale and shrunk ; he lay but a few minutes in one posture ; he then turned and struggled, and a sort of foam issued from betwixt his closed teeth, while his lips were retracted into a grin ; his cheek was distorted, and his jaws worked perpetually, so that you heard his teeth grinding. He was permitted to lie too long in this desperate state unassisted. When my brother and I saw him together on the third day, the paleness of the face and coldness of the body had increased, the stools were involuntary, the pulse extremely feeble, almost imperceptible ; we called immediately a consultation : perceiving, though there was not the slightest swelling, a degree of livor on the temple, my brother made an incision, and, turning down a large angular flap of scalp and temporal muscle, uncovered the temporal bone down to the zygoma, and in doing so, felt his knife grate against a rough and wide fracture ; the flesh of the muscle being cleared away, a very rude fracture was seen to run horizontally through the parietal and temporal bones, its branches passed down under the zygoma to the basis of the skull, blood oozed through the chinks of it,

and a large trepan being applied directly above the zygoma, very black grumous blood rolled out. He died in about fourteen hours."

Your own good sense will suggest to you that, besides those decisive conditions of the intellect and bodily functions which I have endeavoured to characterise, there must be many intermediate states, extremely perplexing and difficult to resolve into any simple principle; in all things I wish to leave you to your own discretion; in many, I am sorry to say, you can have no precise rules from any teacher, but must trust to your own penetration and judgment: experience, or, in other words, the habit of reasoning, so as to infer from external signs the kind and degree of internal injury, will enable you to resolve the most anomalous symptoms; but that condition of the brain in which general suffusion of blood is followed by inflammation, delirium, and death, that condition which is marked by convulsions and spasms resembling those of Hydrocephalus, and with a pulse indicating nothing of oppression, is of all the anomalous states of the organ the most frequent. I cannot remember that I was ever more perplexed how to act than in the following case.

"A poor boy, of thirteen years of age, in scrambling with his playfellows, on a Sunday afternoon, about the ruins of a house which workmen were pulling down, fell from one of the windows, a height of fourteen feet, and struck his forehead against a beam. There appeared upon the forehead, close to the root of the nose, a soft elastic tumor, and a general sugillation of blood, which entirely closed the eyes; he was stunned, and lay in a death-like stupor for a quarter of an hour, but entirely recovered: he had

been universally bruised, for he vomited blood, which also flowed in a full stream from his nose ; his pupil was contracted ; his pulse, regular and strong, beating ninety in a minute. Next day the vomiting continued ; his pulse was still full and strong : upon being bled the vomiting ceased, and the pulse subsided both in strength and frequency : the night he passed tolerably, though restless, feverish, and pained ; he often carried his hand to his forehead, complained of the pain, and sometimes talked wildly through his sleep. The second night he passed in great confusion, with much delirium, and when most rational he complained grievously of his head, while a thin and bloody serum distilled from his right ear, with great pain behind the ear, where it would appear he had sustained a degree of injury, which might well happen in a fall so irregular among stones and beams. On the third day, the tumor of the forehead subsided, and the eye-lids opened : on pressing the tumid part of the forehead, he complained of intolerable pain ; his pulse continued high and rapid ; the bleeding, purges, leeches, and other sedatives, were renewed ; his sleep during the night of the third was more composed and natural, and he had no unfavourable change till ten o'clock in the morning of the fourth day ; then he became very hot, feverish, and restless ; vomited much ; the vomiting was excited by repeating the cathartic, and even by taking the acidulated drinks which were ordered him ; at four in the afternoon he was seized with extraordinary contortions, and strong spasms of the abdominal muscles, with violent tremors of the whole body, and grinding of the teeth : his breathing was affected by the violence of the spasms in the abdominal muscles ;

it was noisy and laborious, but not slow nor oppressed, and the pulse beat one hundred and twenty in the minute : towards afternoon all parts of the body were at times convulsed ; he howled as if distracted with pain of the head, and his eyes squinted horribly ; he grinded his teeth continually, his features were distorted, his arms and fingers stiffened and crooked with cramps and spasms : his condition this day and evening reminded me of the condition of boys in the worst stage of acute hydrocephalus or inflamed brain. At ten at night, he had, after suffering thus violently all day, subsided into a sort of stupor, without vomiting, but with a rapid pulse.

“ The night of the fourth was restless and miserable, but much of it he passed in a state of stupor : on the fifth day the swelling of the forehead had entirely flattened ; that of the eye-lids was gone ; nothing remained to denote the place of injury, but the general suggillation of blood with which the forehead and eye-lids were discoloured : at five this evening I found him quite sensible, complaining of excruciating pain in the head, screaming with the torture, and his eyes horribly distorted, especially the right one, which was turned downwards and inwards till the iris was almost hidden under the inner angle of the eye. This night he had much delirium, and while conscious complained of pain of the head, especially behind the ear ; for though he felt pain of the forehead when pressed, he felt pain behind the ear and through the head at all times : he howled much this night from eleven o'clock, and his thighs were rigid and his toes crooked with the spasms.

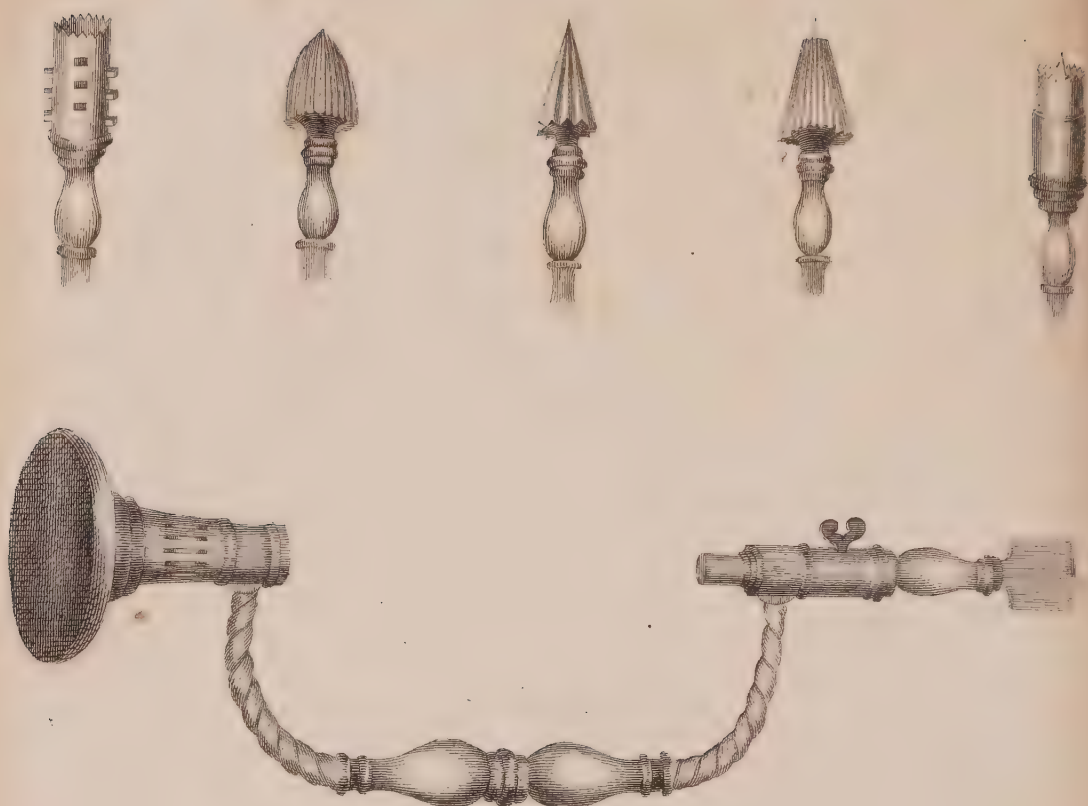
“ On the sixth I found him dead ; he had raved

the whole night long, had cried continually with the pain of his ear and forehead, was seized betwixt two and three in the morning with such universal spasm, squinting, and howling as he had had on the afternoon of the third, and at six in the morning he expired."

Here was no symptom of extravasation nor of compression ; none but of inflammation ; and against inflammation what could I have done by tearing the skull with the trepan ? It was not for want of those marks which are usually thought a vindication by those who are impatient to apply the trepan, that I refrained from using it, for I distinctly felt a fracture in the forehead, accompanied with a degree of depression in the place of the frontal sinus ; but from a perfect consciousness that my operation could do nothing but increase the inflammation, and from a persuasion that the fracture was a concomitant merely of a more fatal disease : I reflected seriously, and found myself assured, from the symptoms, that inflammation was the principal disease ; that fracture at this point could be attended with no remarkable depression ; that if it was extensive, it must run through the basis of the skull ; and I had the satisfaction, melancholy though it was, of discovering, on dissecting the boy's head, not the slightest extravasation upon the dura mater, but the surface of the brain universally reddened, and its vessels turgid, and there was a wide fracture, beginning at the orbitary plate of the frontal bone, and running quite across the foramen magnum into the occipital bone ; but without any remarkable appearance either under the bruised part of the forehead or behind the ear.

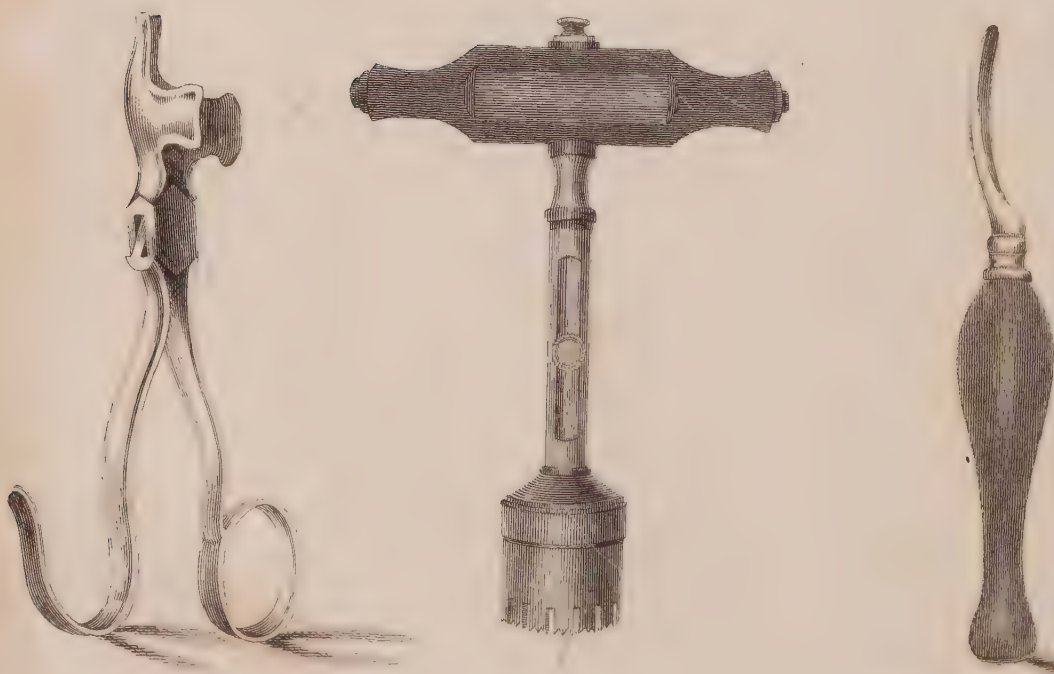
Exfoliating Trepan.

p. 357.



Modern Trepanning Instruments.

p. 367.



Drawn by J. Bell.

Engraved by J. Stewar.

I will no longer detain you, but hasten, after a short section on the mechanical part of your duty, on the operation of trepan, to lay down rules for your general conduct, not without a confidence that, among the variety of delineations of the disordered conditions of the brain, narrative or descriptive, which I have laid before you, you will be able to find rational parallels for a great proportion of the accidents which may overtake you in your future practice.

OF THE OPERATION OF TREPAN.

In the adjoining plate, I have placed those instruments of a conical form, now obsolete ; in the next plate are those used by the modern surgeon : if you conceive, as I trust you do, the essential purposes of the operation, I have no fear of your using them with sufficient dexterity and address ; and my instructions on this head shall be few, plain, and simple.

The instruments of the old school, represented in this plate, belong chiefly to the operation of exfoliating carious parts of the cranium, as those represented in p. 268 ; viz. the chisels, mallets, and googes, relate to the operation, now justly reprobated, of enlarging the openings made by these small and conical instruments, or breaking up the intermediate points of bone, so as to lay many perforations into one. The instrument (a) is that which is distinguished by the name of Trepan ; and in using it the head (b) is pressed by the chin of the operator, while he turns the instrument, as a carpenter does his auger, with rapidity and good effect ; but as I prefer deliberation in an operation of this nature, I use the trephine. The point (c) is that peculiarly designated the exfo-

liating trepan ; for, by cutting off the surface without perforating, it shaves away whatever depth of the bone seems corrupted ; and it is with such an instrument, though unquestionably endangering the dura mater, that the older surgeons completed the whole perforation. (d) and (e) are various forms of exfoliating trepans, designed for perforating the bone from point to point, in order to permit the granulations to shoot up through the outer table of the skull, and cover its surface when in danger of caries. (f) is that small trepan which was in use when Godfredus perforated the Duke of Nassau's head twenty-seven times, and is formed thus conical to prevent its perforating too rapidly, or passing in suddenly, so as to endanger the dura mater ; while (g and h) are two forms of the crown of the trepan, in which any such accident is prevented by permanent or moveable stops, by projections of the crown of the trepan itself, or by pins laid across it, to measure the depth to which it is to be permitted to penetrate.

But we do not now prevent the integuments from reuniting with the skull, nor conceive exfoliation to be an essential part of the cure : the operator trusts to his address for completing the perforation, without plunging through the opening, hence the crown is made cylindrical, not conical, and sufficiently large to give a free issue to matter or blood without repeated perforations, or the help of chisels and googes. The simple form of the modern instrument marked (i), in the next plate, turning in half circles with the hand, is found to perforate quick enough, and to be extremely manageable, since the saw is easily inclined so as to continue its semicircular incision on that segment or side of the perforation which is least cut. The for-

ceps (k) take out the piece of bone, either by their circular lips (l), corresponding with the circle of the crown, being introduced into the circular cut to seize the sawed piece, or by the points (m) being introduced to poise it out. The lever (n) is sometimes useful in poising out the piece separated by the saw, but the point of it is too blunt and round to be very serviceable, in any but its proper office, which is to poise and raise up whatever depression of the skull requires to be elevated; and the levator and the forceps are equally used in twisting or poising out loose pieces of the skull.—These are the simple instruments now laid in the operating case; along with which you are usually provided with a brush to clean the teeth of your saw; a second head or crown, of the same diameter with the first, that while the one is blunted, or when it is unscrewed for the purpose of being cleaned, the other may be used; a knife is also laid in the case, for dividing and raising up the scalp, and often a rugine or triangular instrument, like a caulker's iron, for scraping away the pericranium, which I never do, for I find it unnecessary, and do not think it right nor safe.

First, For the disposition of your Instruments and Dressings.—They are to be laid in two small plates, within a doubled table-napkin, the napkin being pinned so over the bottom of the plate that it may not shift, nor any awkward accident happen. On the first plate is deposited, within the folds of the napkin, the trephine, the centre-pin of the crown, the key to unscrew it with, the lever, the forceps, a toothpick, and a brush; on the outside of the cloth is laid a knife and sponge, soaked and squeezed, so as to be ready for use. On the plate of dressings are to

be laid, lint nicely folded into smaller and greater compresses, very soft; a little square piece of oiled lint; a broad compress of four or six folds of old linen; a double-headed roller, three ells long, pinned at each end, so that when lifted, however hastily, it may not run down; and in the cloth that covers the plate should be stuck one or two needles, of the smallest size, threaded with a double thread waxed.

Second, For the Posture of your Patient.—If composed and sensible, and capable of sitting erect, you should place him on the ground, as a dentist places his patient. The assistant, who is to hold him, should have a board laid across his thighs, the patient's shoulders fixed between his knees, and the patient reclining his head upon a pillow laid upon the board; the assistant should lay his hands gently over the head so as to steady it, and in such a manner as to use, without change of posture, greater exertions if required. Where the patient lies insensible, he should be moved towards the side, or towards the head of the bed; his head laid on a pillow, steadied by a board under it; unless the couch on which the patient chances to be laid is itself sufficiently firm; a bed never is.

Third, In Cutting the Integuments.—The first step of your operation, you lift from the outer cover the knife and the sponge; the sponge, small and compressible, you hold in the palm of your left hand, under the ring and little fingers; you lay the mid-finger, fore-finger, and thumb of the left hand broad upon the scalp; you feel with the point of the left fore-finger, and by it guide your knife through all parts of the incision. First, If the scalp, having been once detached to a great extent, is reunited, but over

a carious bone and suppurating brain, the hollow integuments admitting the probe to turn to a great extent over the diseased skull—you take, in place of the round edged scalpel, a blunt pointed bistoury, and running it along, you at one stroke disengage the flap of diseased integuments, and turning it down see the whole extent of the dry, yellow, and blackened bone: your perforation should be central in respect to such caries. Second, The scalp having risen in form of a puffy tumor over a contused part of the cranium, you make, with the round edged scalpel, not a crucial incision, for that makes four small angles in the scalp, the raising up one or more of which displays but little of the diseased bone, but an incision in a tripod-like form; then the three points being dissected away from the skull make a very large opening, and even two only of the points being raised they make, as being two thirds of a circle, a very free opening: here too the state of the skull marks the danger to the brain; but, in place of being yellow, rough, or blackened, it is usually only dry, not shining, nor brilliantly white, not attached to the periosteum or integuments; sometimes it is spotted or tinged with yellow, and devoid of circulation, and does not bleed when scraped with the point of the knife. Third, When after a dreadful fall, the skull is cruelly fractured, pieces beaten in, and the fissures wide, circumspection is so natural, and you can so distinctly feel with the point of the left fore-finger those asperities and openings, through which your knife might plunge into the dura mater, that I need but to intimate the danger. But, Fourthly, When from a desperate fall upon the steps of a stone staircase for example, the patient lies in a deadly stupor,

cold, pulseless, moaning, the integuments never rise into a tumor nor become ecchymosed, except very slightly; they remain entirely flat for days, because the man is almost dead; the hemiplegia alone, with some slight blemish on the scalp, directs you on which side to operate, viz. the side opposite to that which is palsied, and from the convulsed or dying state of the patient you must do so quickly. The surgeon in such case, operating without a certain knowledge of the state of the skull, is in danger of plunging his knife unawares through a wide fracture. I have witnessed this disaster; let such incisions then be done carefully.

Allow me to add to these particulars a few general instructions. Do not seek to pursue the several limbs of a fracture, for to these your operation does in no shape relate; but seek the central point only, where the weapon or sharp stone has penetrated, or where the depressed angle is kept down by the firm and sound bone. Do not seek to scrape the bone, that you may trepan easily; I never, in amputation or in trepan, found the soft parts entangle the teeth of the saw. In trepanning, I only cut away that cellular substance into which the extravasated blood is strongly injected, sometimes solidly impacted, and no farther than to procure a distinct view of the fractured pieces. Do not lay pieces of lint on the integuments, intrusting them to awkward assistants to hold them back while you perforate; for it is the sensibility of the integuments that makes the patient cry, resist, and struggle, which at once impresses the spectators with horror, and brings the reproach of cruelty on the surgeon, who must complete his operation in the midst of such cries. If you would avoid

this unseemly scene, use spathulas or flat plates of iron, such as Mr. Croker King calls defenders, to hold aside the integuments, and the perforation, which should be slowly and deliberately performed, will not seem tedious nor cruel.

In Perforating the Skull.—Ascertain first the place most fit for perforation, viz. on the angle of depression, and in the line of the fissure where the fissure is wide and gaping; on the broken bone, if it be firm, on the sound, if it be so unsteady as not to bear the pressure of the centre-pin, or the working of the saw; in the middle of the carious portion, when there is caries without fracture; and anywhere on the side opposite to that paralysed, but especially a little below and to one side of the centre of the parietal bone, when there is reason to believe the brain oppressed by extravasation, without any visible injury to mark the place.

Lift first the crown of the trepan you mean to apply; press it firm to the bone, and make one or two turns in order to mark the centre of the circle, by penetrating with the centre-pin a little way. Next dismount the trepan head; take the triangular perforator, and having fixed it in the shaft, bore with it a central hole, for the centre-pin, deep enough to hold it securely while you perforate: then mounting the crown of the trepan again, place the centre-pin of it in that hole, and begin to saw; in cutting with the trephine, which turns in half circles, observe well the way in which the teeth are set, for they are set obliquely; you may be turning and twisting it, and that very vigorously, as I have seen some surgeons do, without cutting more than a right-handed person would pierce a cork by turning a left-handed cork-

screw : as your trephine turns but half circles, you must inevitably cut deeper on that side of the circle towards which the hand turns ; you must therefore probe frequently (especially when there is much bleeding, or when you are sensible of having cut deep) with the tooth-pick ; and when you feel that you have penetrated on one side, change your posture, turn half round the patient, which, by giving your hand a new inclination, sets its right for cutting what remains, which, in such delicate circumstances, and having so nearly completed the perforation, must be cautiously done and slowly.

In the course of perforating, while you probe with the quill, you give the crown of the trepan to your assistant to be brushed, or to be altogether changed ; and when you are satisfied of the depth of your perforation, he, in returning it to you, wipes away the saw-dust with the same brush.

I seldom have completed the perforation, never have got out the trepan circle sticking in the crown of the trepan, but have sometimes poised it out with the handle of the scalpel, or the pointed extremity of the forceps marked (m). While sawing, whether in trepanning or in amputation, never think to overcome difficulty or resistance by pressure, but when you feel opposition cut lightly, and turn the saw nimbly ; lighten your hand when it threatens to stop ; never in sawing a long bone expect to loosen the saw by pushing and wriggling, but by withdrawing it, nor in trepanning by pressing onwards, but by turning the trephine half round backwards. Choose trepan crowns with the sides grooved and sharpened as well as the points of the teeth, for that kind of saw cuts wider as it goes deeper, and works the whole

circle of the bone large and free for the trepan to move in.

Fifth, In respect to the Object of the Perforation.—You will find that extravasated blood rolls out spontaneously, in black and firm clots, through the trepan hole ; and from dressing to dressing is easily hooked out, with an armed probe, or washed out with tepid water, the dura mater coming gradually into closer contact with the skull. Pus flows out still more easily, and multiplied operations for either purpose (of letting out blood or pus) are extremely imprudent ; to repeat the perforation is sometimes necessary, on account of a great depression attended with manifest danger, where the edges of the depressed portion are fast locked under projecting corners of the firm skull, and the lever being introduced first into one, then into the other perforation, the depression is raised, but never without great force, usually a loud noise, and sometimes, as I have argued, with unjustifiable violence, insomuch that on many occasions, especially where the depression is flat, extensive, and having probably no offending points, I would rather leave it unreduced. Unless in depressions of a singular and dangerous form, punctured fractures, and those where, from their peculiar form, there is strong reason to suspect *spiculæ*, I am not curious about depressions, nor over anxious in raising every point*.

Sixth, In respect of Dressings.—I would entreat you to consult your own good sense, rather than hearken to the common ignorant advice of laying merely a piece of oiled lint on the wound, and over

* Much may be done by a dexterous operator with small saws, similar to those revived by Mr. Hey, and by strong tooth forceps.

that a poultice. The old practice of cutting a circular piece of cloth as a syndon, and cramming it under the skull to support the brain, and leave room for matter and blood flowing out, I entirely disapprove of, but neither can I approve of leaving it quite unsupported ; in short I dress the trepanned skull, as I do every other wound, nicely and careful : first, I lay the edges of the scalp smoothly together, sometimes stitching it with one or two points of the needle ; then I lay upon it a small pledget of oiled lint ; next a small and rather firm compress of lint ; next a general compress over the whole of that side of the head ; and finally, I roll the head gently, but steadily and somewhat firmly, with a broad roller, and put over that a thin linen cap, lightly tied under the chin.

I allow no poulticing, except what is necessary to bring off the first dressings ; and no washing nor curious cleansing of the wound, which I wipe slightly, and dress with very little ointment, almost dry : when blood still exudes, that makes an exception, being a special case ; and when a fungus threatens to protrude, and even where only the sound but granulating dura mater projects through the trepan hole, I find it necessary sometimes to depress the dura mater, or push aside the fungus, to let the matter, confined from dressing to dressing, flow out ; then, contrary to my usual practice, I think it right to dress morning and evening.

When, in the course of the cure, fungus protrudes and fills the opening, and the confinement of matter causes stupor and hemiplegia, and the inflammation of the brain, cries and convulsions, I reckon my patient lost ; but I am proportionably more diligent in my methods of procuring a free efflux of the matter,

and I think it better to shave off the protruding fungus than to apply escharotics, which I have usually found hurtful *.

It is invariably found that noise, heat, wine, passion, and other exciting causes, are fatal to those who have suffered the operation of trepan. The confusion of a storm; after a battle at sea, the renewal of the engagement; the hour of firing the batteries in a besieged city; the intrusion of unwelcome visitors in the chamber of a private person; quarrels, intemperance, or venery, have in many instances brought on inflammation of the brain, such as has proved fatal to those far advanced in their recovery after this dangerous operation; therefore let them be kept low, still, quiet, with a loose belly, a perspirable skin, little light, and few visitors, and no conversation but such as is composing and cheerful.

APHORISMS, OR RULES OF PRACTICE, DEDUCED FROM
THE FOREGOING DISCOURSES.

WE have examined in detail every point of practice, and are now arrived at the conclusion of these Discourses, in which it is natural to recapitulate whatever is important, and ascertain whatever rules should particularly dwell upon your memory. This task, could I entirely acquit myself of prolixness in these discourses, might be spared; yet it will be useful, I doubt not, to explain in short Aphoristic Rules what an experienced surgeon would naturally do in any given case.

First, Above all things I counsel you to beware of

[* I have experienced the most happy results from compression; at all events, the parts should be supported against further protrusion.]

precipitation ; the only fault which can incline the surgeon to conceal the circumstances of his private practice, or leave upon his mind any lasting unhappiness : I entreat you on every new occurrence to think deliberately, judge soberly, and act gently ; however urgent a case may seem, be in no haste to operate, take time to consult, and rest assured that Nature will often perform a cure while you are deliberating upon an operation ; be also assured that you can never fail, in the worst cases, to foresee the patient's death, by his coldness, paleness, convulsive motions, and involuntary stools : if these signs have not yet appeared, you have time for a few hours deliberate reflection ; if they are already begun, you have then least of all any motive for precipitate measures, you are surely too late, the patient must die.

Second, Fractures and injuries of the head are more frequent in public hospitals, where the friends of the patient, or the spectators of any unfortunate accident, leave him almost inanimate, perhaps with only some slight apparent injury of the head, while there is some serious damage to the brain, the nature of which you are ill able to develope, without knowing how the patient was struck or where he fell : let your first step be to collect the friends or spectators, and inquire into the circumstances of the fall or blow. Let it be an especial rule with you, never, in these cases, to do any thing precipitate or rash.

Third, Every man of prudence and discretion, while he examines the wound and reasons on the symptoms, inquires into the circumstances in which the patient was hurt : whether by a fall or by a blow ; whether, when he fell, he was drunk or sober, helpless, and pitching headlong, or in his senses, aware

of his danger, and by extending his arms breaking the force of the fall: whether he pitched headlong over a rail, or tumbled down stairs, touching each step: whether he fell on plain ground, or on a declivity: and if he received a blow, whether it was struck by accident or by design; at arms length or close; with a heavy weapon or with a sharp one; by a feeble man or a strong; by a drunk man without aim or force, or by an angry man, in the height of rage, and with full effect.

Fourth, There are certain kinds of accidents which import danger, each according to its peculiar nature; as a concussion, a contusion, a wound with a sharp weapon, a punctured wound. Writers on jurisprudence have long distinguished these kinds of wound, of which the danger is in some immediate, while in others it is deferred till the fortieth or till the hundredth day, and have been accustomed to affirm that the more the skull is fractured the less the danger, the breaking of the skull deadening the force of the blow. Of all the quaint reasons which authors have given *, not one is true; but yet it is a fact, that the man who has an extensive fracture of the skull escapes, while he who has no fracture dies. It is not because the yielding of the bone lessens the force of the blow upon the organ which that bone protects,

* The French surgeons have been accustomed to say, that the more the skull was fractured the less the danger. They imagined that the giving way of the skull saved the brain. One of their most celebrated surgeons says, If you take, for example, the stave of a barrel in both your hands, and try to break it by striking it on the ground, if it break by the blow, the shock terminates at the place where it breaks across, and you feel no unpleasant sensation; but if the stave continue entire and resist the force, the impetus with which you strike it upon the ground is reverberated to your hands, which are benumbed and pained.

but because concussion is a more dangerous injury than fracture, even though accompanied with deep depression of the skull: there is great danger in the case of concussion, though there be no fracture! there is little comparative danger in fracture when there is no concussion! when, from the nature of the fall, the concussion is great, no degree of fracture can lessen the danger, for the danger lies in the concussion or injury of the brain which is produced by a fall, not in fracture, which affects only the skull, and is occasioned by the blow. If a mason fall from the tiles of a house, or a sailor from the yards or rigging of a ship, and fracture his skull, the greatness of the fall lessens in no degree the violence of the concussion; the extent of the fracture marks rather a probable concussion, of which, if it be great, the patient dies: but if the tiles fall upon the mason, or the sailor is knocked down by the falling of a block and tackle, a great fracture does not cause an equal degree of injury, much less if he is knocked down with a handspike, and still less if his skull be but cut with a cutlass; the fracture may be in such cases great, and the concussion and consequent danger slight: in short, the skull is most fractured by those blows which are least injurious, and least injured by those general shocks which cause the most dangerous concussions and extravasations in the brain.

Fifth, As a bruise is worse than a wound, and a sprain or luxation of a limb more distressing in its consequences than a fracture, so is concussion of the brain more dangerous than wounds or fractures of the skull: to the distinctions I have hinted at, I should wish to remind you of one which I have remarked: if by a fall your patient lie in a state of

stupor, it may be from concussion : if, after a smart blow with a bludgeon, not heavy nor depriving the patient instantly of his senses, it must be from extravasation.

Sixth, It is not with every kind or degree of stupor that an experienced surgeon is alarmed ; he is accustomed to distinguish many kinds, as well as degrees, of that affection : the stupor may be that of intoxication, which, by the smell and the vomiting, he often is able to distinguish, and never is afraid to leave the head of the patient untouched till the longest period of intoxication (if it be intoxication) and all its consequences have expired ; or it may be that of slight concussion, which, being attended with no oppression of pulse, nor suspension of breathing, is soon resolved by the natural force of the circulation : or it may be that stupor which, in old age, generally follows a blow or fall, without indicating, as far as I have observed, any permanent injury : but if the stupor, though slight, is accompanied with vomiting and a slow intermitting pulse, there is reason to apprehend the most imminent danger.

Seventh, Nor does every degree or kind of delirium alarm him : delirium, arising after stupor, is a favourable sign. A wound of the scalp is often followed by erysipelatous swelling, and a short and harmless delirium. A patient, thrown into an hospital with wound of the scalp, is often seized with sudden rigors, vomiting, high fever, and delirium ; but these are the symptoms of hospital fever merely, and might as well be superinduced after a wound of the finger as after a wound of the scalp. One who has formerly suffered much from fevers, or who has been insane, is more apt, as I have known in several

instances, to awaken in a state of phrensy, after lying some time under the stupor of a blow. These are not dangerous cases of delirium; and though stupor, insensibility, rigors, and other marks of suppuration or of effusion of blood, may be motives for applying the trepan, delirium, as far as I can recollect or imagine, never is.

Eighth, I believe the danger to be prognosticated is very nearly in this gradation. Stupor, though deep, and to the tyro seemingly very dangerous, is not a cause of immediate alarm to the experienced surgeon. Delirium, succeeding such stupor, shows that the vascular action is begun, and the oppression at an end. Slighter somnolency, free from stupor, in which the patient has his senses (though inclined to sleep), but with a heavy, oppressed, and intermitting pulse, is extremely alarming, and requires the trepan. Stupor, accompanied with dilated pupil, and palsy of one side, indicates the most imminent danger, yet such as is often relieved by the trepan. Stupor, in which the face is pale, the extremities cold, the pulse not heavy and labouring, but quick and fluttering, especially if attended with palsy of one side, or slight convulsions agitating the features or the limbs, is a state altogether to be despaired of: yet perhaps it is even here our duty to operate, but without hope.

Ninth, The prognostics from tumors, I must remind you, are still more interesting; for any peculiarity in the tumor indicating the death of the bone below, more certainly foretels danger to the brain than the most formidable fracture. First, Where the scalp merely is wounded, perhaps punctured, but no tumor ensues, the patient is often affected with

spasms in the face, and the most ludicrous contortions of the mouth; this is a symptom much resembling that contraction which follows the wounding of a nerve in bleeding, and, like it, requires an incision. I have at this moment, under my care, a little boy, of ten years old, who, having fallen over a staircase in swarming the balustre, was taken up apparently dead, has lain for two days in a state of deep stupor, is now entirely recovered from it; he has his mouth turned more entirely to one side than I ever saw it in a paralytic, and though able to run about among his play-fellows, does not expose himself among them; this, I have promised confidently (because I have often seen it), will go off*. Secondly, Erysipelas often seizes the scalp after slight wounds, extends over the face and ears, closes the eye-lids, is attended with smart inflammatory fever and delirium, but subsides in a few days. Thirdly, A bloody effusion, if the blood be in great quantity and the effusion permanent, is sometimes dangerous to the skull; but I must remind you of a danger of another nature, viz. of a feeling as if of depression of the skull, so particular that even the experienced are apt to be deceived: but an experienced surgeon is in no haste to make incision into such tumor, even though the patient is vomiting, and in a state of stupor; these usually are but the first consequences of the injury, and, like the tumor, vanish. I have seen extravasation so extensive as to fluctuate from ear to ear, and yielding so as to admit the finger to feel depression of the bone, yet the whole has been absorbed. Fourthly, The most portentous tumor is the least

* The reader is probably aware that the cause of this is now discovered.

formidable in appearance ; for it is one which proceeds neither from extravasation nor inflammation ; it is neither red, inflamed, fluctuating, nor extensive, but arising from the death of the cellular substance next the bone, and from the impossibility of the dead surfaces renewing their adhesion, thence it is emphysematous, puffy, small, circumscribed, not painful : is accompanied with rigors or febrile shiverings, and starting or nervous tremblings ; confusion of head, and feebleness of body and mind : it is the most desperate disorder with the slightest symptoms : suppuration of the dura mater is begun, and if, upon the slightest intimation of this kind of danger, the patient be not trepanned, he dies.

Tenth, As your preceptor, I am much more jealous of your being found wanting in judgment than in skill. Your operations, I doubt not, will be performed with address, but I am truly anxious that your address should be reserved for occasions of real danger, and that the powers of nature should never be anticipated, nor interrupted, by any rashness of yours. First, Be not too confident in promising a speedy recovery, even in slight and cutaneous wounds, for the bone, though not wounded, may be deadened by the blow ; but lay the edges together, and lightly and gently, so as to procure reunion : dress the wound dry with lint, court-plaster, and a sprinkling of hair-powder, which, by caking with the blood, keeps the edges of the wound in close and nice contact : and watch your patient's condition constantly, especially where the wound has been made with a bludgeon, a stone, or any blunt and heavy body. Second, Be not afraid of an open though apparently a desperate wound, even when the skull is cut or

fractured, even “where the splinters of it lie pashed upon the dura mater:” there is in such a case undeniable danger, since the bone is wounded and all the parts inflamed which defend and lie in contact with the brain; but such open wound, though wide, is often less dangerous than a slight contusion; it is but a compound fracture of the skull, and you have no warrant for doing any thing which you would not do in a compound fracture of any other part: when I spoke of Parée’s operation on Captain Hydron, and of bone reuniting with bone, I meant but to illustrate a general doctrine, not to announce a rule of practice: I advise you, on the contrary, to pick away carefully every fragment of the skull, to dissect away whatever little fragments you may find adhering to the scalp, and to lay down soft and sound integuments only upon the wounded skull and exposed dura mater. Third, Be not careless of cleansing the scalp and laying it nicely and smoothly down, because of my having proved to you that ragged integuments or scalp, having even its inner surface ingrained with mud and dirt, has adhered, for such proofs were but meant to illustrate a general principle, to show how tenacious both the skull and integuments are of life and circulation: to lay them down ragged or foul were the height of presumption, and a most culpable carelessness; pick the surfaces, cleanse them with the sponge, do every thing to entitle you to success; when you bring the lacerated parts together, do it lightly, and dress the edges dry; do not, in your anxiety to cleanse them from sand or mud, wrap the head in a poultice, expecting to unite the parts after suppuration is begun, for after suppuration they curl backwards and retract; they never, as far

as I have seen, can be laid together again, but heal with a gap equivalent to an actual loss of substance. Having brought the integuments together, watch the state of the wound diligently, and the instant you observe the swelling of the scalp, from matter that is confined, and you find the bone bare, and the probe admitted under the diseased scalp, lay the wound open, and then use a poultice, and wait patiently the granulation of the naked bone, or the signs of internal suppuration, to direct your future steps. Fourth, Be upon your guard against the irretrievable fault of making incision into the integuments when they are entire, however distinctly you feel a fracture or depression through them, for it is wonderful how happily the hurt parts heal and the extravasation of blood is resolved when the parts are kept entire; the making an incision in such a case is converting a simple into a compound fracture, with all the dangers of it; nothing can vindicate you in taking such a step but the most unequivocal proofs of a concomitant extravasation of blood, viz. oppression, somnolency, a heavy pausing pulse, a dilated pupil, and palsy of one side: make such incision (the integuments I mean being uninjured) only after great deliberation in adults, and in boys never, or almost never. Fifth, Be not too rash in entering upon an operation, merely because the patient lies in a state of stupor or breaks out into delirium; those are the cases which least frequently require the trepan: and when you are entered upon an operation, be not too particular in raising every point or piece of bone that either seems or is really depressed: but above all, be not too late in operating when there is reason to suspect a suppuration of the dura mater;

make it a principle, whatever the occasion may be for using the knife or saw, to be sparing of the integuments, for the loss of them affects the skull; to be still more sparing of the skull, for it supports the dura mater; and to think with the utmost reluctance of puncturing the dura mater, strong as the suspicions may be of blood being extravasated under it, for, like a second skull, this firm and strong membrane supports the brain after perforation, and when it is punctured the brain is deprived of all support, and I have never failed to see it protrude: I will not disguise from you that this operation of puncturing the dura mater is sometimes successful, that it is reported so by creditable authors, but it is my duty to warn you that I have always found it fatal.

Eleventh, In respect to the medical treatment of your patient, I must remind you, that the first moment of stupor, coldness, and paleness*, requires cordials; but the reaction that follows requires that the powers of the circulation should be repressed: and I must also remind you, that such accidents happen chiefly to workmen, vigorous, strong, and healthy, full of blood, and often in the prime of life; that though there are many who boldly deny the use of bleeding, they speak from theory, while none dare neglect it who are acquainted with practice: many times the patient lifts his eyes and moves his limbs while the blood is yet flowing from the vein, and many are thus recovered who otherwise would never move them again. Bleeding is useful in all contusions, falls, and blows, to arrest the progress of extravasation; but where extravasation has already

[* If there be danger of dissolution.]

taken place, and one side is palsied, blood should not be too profusely drawn away, lest the strength suddenly sink: the brain being already compressed and the vital powers low, it is peculiarly dangerous to draw away much blood. In concussion, which is an apoplectic state of the brain, consisting at once in fulness of vessels and general exudation, bleeding relieves the oppression and promotes absorption: in stupor, with a heavy pulse, throbbing gradually stronger and stronger, and increasing at the same time in velocity, bleeding must be used to prevent the reaction rising to delirium: and when delirium actually rages, and the patient starts from his bed, and strikes and struggles, it is most eminently required to save the organization of the brain from the intense action of its own vascular system. Frequent bleedings, drastic purges of calomel, cold applications, and cool air, are useful; blisters and opium, doubtful in their operation; and all other stimulants, as wine, volatile alkali, &c. quite improper.

I am now, gentlemen, to take my leave of you, which I do with this consolatory reflection, that I have endeavoured, sincerely and soberly, to fulfil my duty to you in every point; and indeed I trust that you share this feeling with me, and will not forget the hours we have passed together, nor find them unprofitable in your future course of practice. It is possible that the rules which I have just laid down for your conduct, in special cases, may have qualified, corrected, and defined many imperfect conceptions, and may serve to concentrate your more diffused knowledge, and make it practically useful. May I be permitted to wish, or to hope, in the simple and dignified words of Bacon, That Providence may have

enabled me, through you, to become a means of alleviating the sufferings of our fellow creatures, and the miseries inseparable from human nature. “ Quamobrem quum hæc arbitrii nostri non sint; ad Deum Patrem, Deum Verbum, Deum Spiritum, preces fundimus humilimas, et ardentissimas, ut humani generis ærumnarum memor, et perigrinationis istius vitæ, in qua dies paucos et malos terimus, novis suis eleemosynis per manus nostras, familiam humanam dotare dignetur.”

The Reader will observe, that the Editor has placed in regular order all those parts of Mr. John Bell's works which treat of wounds. This part of the work is here completed.

OF THE
PRINCIPLES OF SURGERY,

AS THEY REGARD THE

SURGICAL PATHOLOGY

OF THE

SCALP, PERICRANIUM, SKULL, AND DURA
MATER *.

SECTION I.

DISCOURSE ON THE ANATOMY OF THE CRANIUM, AND
THE RULES OF PRACTICE DEDUCED FROM IT.

IF ever learning has retarded the progress of science, it has been in our profession. Physicians devoted to scholastic learning, secluded, by the false dignity which they assumed, from the actual practice of our art, and from all the sources of true knowledge, have

* In this portion of the work of Mr. John Bell, I have been particularly careful to retain all his own cases and observations, only cutting off some unnecessary illustrations, and the Latin and French notes, when they go only to authenticate the translations in the text of the work.

The cases here are curiously and happily minute, and illustrate a most important part of pathology. When authors have some fancied improvement in practice, or some new operation to bring forward, which they think reflects credit upon themselves, we have abundance of meagre cases. But how seldom do we find a pathological subject pursued with such ability and minute perseverance as in the portion of the work that follows! I must say, I know no other example of this devotion to a professional object.—C. BELL.

actually been the authors of those aphorisms and rules which guide the surgeon in his most important duties, and which hold an influence over the profession even to the present hour. Hippocrates wrote with such truth and brevity, with so sound and discerning a spirit of observation, and recited so carefully the signs of danger in all kinds of wounds and injuries, that he has been held in continual reverence; unfortunately his aphorisms have been held sacred in all ages; and no one has followed him with any more liberal design, than that of writing tedious and spiritless comments on his doctrines. Such were the only studies of the middle ages; such comments formed the sole occupation of the famous schools of Alexandria and Salerno, and of all the universities of Europe during the last century; ingenious scholia, on the words, rather than the sense and spirit of Hippocrates, exercised the subtilty of the celebrated teachers, and a vain and scholastic learning usurped the place of real science. Hence it has come to pass, that through all the voluminous writings on fractures of the skull, but one sole doctrine prevails, and one code of rules, deduced not from any consideration of the essential injuries of the brain itself, but from the configuration, structure, and function of the cranial bones; the signs of danger, the prognostics and the rules of practice, being allied, not with the internal disorder, but with the form and circumstances of the fracture, and the mere injury of the bone. Many ages passed thus in the unprofitable study of books, to the utter neglect of practice; and science, in place of being enriched by new facts, was encumbered with the useless parade and pomp of learning. Books were written not to improve the

art, but to blazon the talents of the physician who composed them, and with a quaintness and formality calculated for that sole purpose. Books in our science, like those on theology, were full of endless distinctions, divisions, and subdivisions; and such as remain, or are distinguished, seem to me a sensible representation of the essential forms of Aristotle, a shape without substance. I will not condemn you to wander with me through this desert and sterile region, nor rehearse to you all the follies of those credulous and doting ages; I shall not, though it has been a necessary duty in my own course of studies to peruse these lifeless pages, impose the slightest part of the same labour upon you: but if there is to be found in this mass of antique learning any thing really precious, if there be any explanation of the prejudices and errors which still exist, if there be allusions to modes of practice not yet entirely disused, if the rude conceptions, and still ruder operations of the old school, can serve to regulate your opinions, or help to reform some points of modern surgery; if, in short, there be any thing pleasant, or profitable, or useful, in this kind of learning, it shall be my chief care to select such examples of ancient doctrines, or operations, as may prove interesting to you, and confront them with the opinions and practices of our own times.

A slight sketch of the ancient doctrines will suffice, and will enable you to enter with alacrity on the essential subject of your studies, investigation of the disorders of the brain itself, and the means of relief, unperplexed by futile distinctions, and scholastic terms. You will, by being made to feel the vanity of learning, attain to a free use of your own good

sense, and natural reason ; you will be induced to act with reserve and modesty in all your operations, holding in abhorrence that unlimited use of instruments, that impatient desire of doing something, of mangling the integuments, and scraping and trepanning the skull, which was the proudest work of the old surgeons, and the most disgusting feature in their practice : you will also perceive with pleasure, that modern surgeons, less learned, and more skilful, than the ancients, have, in place of authority, taken plain sense and reason for their guide ; but they have perhaps unwisely neglected the study of those authors whose original doctrines, or learned comments, have given a peculiar complexion to our science, and sometimes thrown discredit on the most precious rules of practice by an unaccountable mixture of ignorance and folly, with sound observation and sterling sense.

Look into the books of the ancients, and you would believe that every capillary fissure were attended with peculiar danger, and that, without the most adventurous operations, the patient could not live. Turn again to the books of modern authors, and you would be persuaded, that “the more violent the fracture, the less the danger* ;” that your patient, though he lie in a deadly stupor, with fractures of the skull, or deep wounds of the brain, needs but to lie undisturbed, and unassisted, to ensure its perfect recovery. Name me one absurd or cruel measure, the amputation of large pieces of the scalp, the scraping of the skull, the widening of fissures, the perforating the cranium with many trepans, and

* Musitani, Garengéot.

opening the dura mater, or even encircling the whole of the skull with trepan holes, for every idle suspicion, or imaginary purpose, name me an extravagance or cruelty for which the man of books will not bring you forth precedents. If you adhere to one author, you are inevitably wrong; if you read many, you are bewildered; and indeed a whole life spent in practice will hardly teach you to reconcile facts, or to attain that steadiness of temper, and maturity of judgment, which should carry you through your professional duties with confidence and peace of mind. If these things be true, it is surely implied, that you must be assisted and directed in your first studies, and that the principles of the science, and the rules founded on them, are to be deduced from a wider range of study than falls to the lot of every reader, and a knowledge of actual practice which the student cannot have. The chief object of your studies must be, to learn the signs and causes of danger, and to judge wisely of the motives which should induce you to operate.

Such is the uncertainty of those signs; so often does our patient fall suddenly into slight paralysis and faints, and expires while we apprehend no harm; so often does he revive from that stupor which seems to arise from extravasated blood oppressing the brain; that the diligent investigation of the true signs of danger, of the causes of oppression, or ulceration of the brain, and of the various motives for operating in these injuries of the head, (a severe and complicated study), should be the chief occupation of the surgeon. But it has not been so;—operations have been more studied than the means of avoiding them; the aphorisms of Hippocrates, and the bloody code

of practice founded on them, have been implicitly copied into modern books.

If the ancients have been the chief founders of medicine, which I greatly doubt, I know very certainly, that in surgery they have done infinite and almost irreparable harm. Their ascendancy in poetry and the fine arts I willingly allow; but how could they excel in medicine, much more in surgery, who knew so little of the structure of the human body, and made so unwise a use of what they knew. Look into their books, and you would believe that the anatomy of the brain or dura mater, the inflammation of its membranes, or the state of its circulation, had no relation to injuries of the head. For the ancients, whose observations, as a first step in science, we may safely admire, and the old surgeons, or rather the old physicians, the commentators and scholiasts, whose absurd learning we cannot but despise, were not anatomists. Physicians were little accustomed, till after the age of Vesalius, with dissections of the human body, sound or diseased. The doctors of the schools never investigated the causes of death, by dissecting the recent body, never swerved from the first authorities of Hippocrates, and of Galen, his earliest commentator; their best preparations were the spoiled bones of graves and charnel-houses; they studied nothing but the bare and naked skull; they called this anatomy, and spared no pains to make this anatomy useful.

We cannot wonder that, their speculations in anatomy being thus limited, their remarks were of the most trivial nature, and yet of the most dangerous tendency. They sat ruminating in their closets over those curious skulls, and numbered their processes,

and described their sutures ; remarked the irregularities in the thickness of the several bones, and imagined a set of surgical observations suited to these descriptions ; observations which, though incessantly repeated by systematic writers as leading to important conclusions, are such as no sensible anatomist, nor practised surgeon, would think of acknowledging.

These remarks begot a passion for operating, which time has not entirely softened ; they have been copied with all the idle pomp of learned quotation into every modern book ; I appeal to you, gentlemen, how much you have heard, how much you have read, about sutures, and fissures, and fractures ; about the sinuses and the cancelli, the tabula vitrea, and the various irregularities of the thickness and thinness of the skull ; and, along with those doctrines, came a rude and barbarous system of practice, that of scraping fissures, of trepanning fractures, of repeating the application of the trepan over a great surface, of cutting entirely away whatever parts of the skull seemed depressed, of tearing away whatever seemed loosened, of using saws and terebræ of various forms, when the trepan seemed too tardy in thus opening the skull, and exposing the brain !

Those who, on the revival of learning, assumed the weary task of explaining the first writers on medicine, were not men of practical skill, but philologists, commentators, men of mere learning ; and they commented best, most learnedly, and indeed most suitably to the text, who showed themselves most ingenious in multiplying the distinction of fractures ; as those were thought to operate best, who found means of applying the greatest number of trepans to one skull. Neither time, nor the authority

of great names, nor the learned languages in which those authors wrote, can consecrate those follies. The great antiquity and high authority of these rules, are indeed the cause why I shall be at more than usual pains to refute them. These select observations and precepts are, by prescription and time, become a part of our profession; they are ingenious; they seem to ensure the natural and essential connexion of anatomy and surgery with each other; they have an imposing appearance, and lay strong hold on the imagination of the young student; they are the lessons the first learnt, and the most difficult to unlearn, and men who have passed with honour through all the gradations of study, and spent years in the successful practice of the profession, continue to respect these observations; those even who have, when emergencies required it, perforated with equal indifference, all parts of the cranium, cannot refrain from mentioning the interdicted points, where the trepan should not be applied. But of all the lessons of the old school, the one most dangerous to the young surgeon is that which teaches how to distinguish fissures from sutures; for the rules for distinguishing fissures clearly imply, that wherever such fissure is proved to exist, it is allowable, it is necessary to trepan the patient; and thence a fracture of the skull, and the necessity of trepanning the injured part, are so inseparably connected in the surgeon's mind, as to form the most essential rule in his practice.

First, You are desired to remark the constitution of these flat bones, “ that they are composed of two tables or plates of solid bone, with intermediate cancelli, (or cellular substance, such as is natural to

bone full of blood-vessels), which bleed when with your trepan you have sawed through the outer table, occasioning at the same time a change of sound." This, though occasionally modified, you are taught to regard as a rule of practice; and, in every elementary book, you find it to be a most important subject of debate, whether, in perforating the skull, you should use the trephine, which saws rapidly, or the trepan, which, from making only half circles, cuts more slowly; or whether you should first use the trephine, till you have cut down to the cancelli, and finish the more delicate part, the sawing off the inner table with the trepan. Never, perhaps, was any remark more unfortunate than this, which refers the surgeon to the bleeding and the change of sound, as signs of having cut through the outer table, and teaches him to be proud of sawing rapidly. Of all operations, this is the one where precipitancy and hurry has the fewest apologies, since the patient usually lies insensible, since the sawing of a bone occasions no pain, since the trepan is an operation where haste may occasion the most dismal consequences, from wounding the dura mater, which, when left uninjured, supports the brain, (after the removing of a piece of the cranium), like a second skull.

This reminds me of that passion, so conspicuous of late years, for inventing instruments which will enable the operator to saw more rapidly; but, in my poor opinion, those who complain most loudly, are those only who know not how to use the common instruments. I have seen an operator so consummately ignorant, as to turn his trephine against the set of the teeth, and wonder how he got on so slowly,

and call for another head for his instrument, believing it blunt. I am persuaded that those who will be at pains to learn the use of the trephine, will find, that a well-sat saw, turned with the hand, works as rapidly as the judgment can guide it. With what unhallowed precipitancy this most dangerous operation is sometimes performed, I need not represent invidiously, by saying, that I have seen the dura mater wounded, that I have by me preparations in which it is entirely divided by the trepan. The fault is acknowledged by surgical writers, with a want of delicacy, with a degree of levity and inhumanity, which is hardly to be endured. Mr. Hill once, in performing the operation of trepan on a boy of eleven years of age, continued to turn the saw after the bone was cut through ; he at last withdrew his trepan, looked anxiously for the circular piece of bone, imagined he saw it lying in the perforation, moving with the motions of the brain, tried with his forceps to pick it out, but in vain, for it seemed to sink with each systole, and so elude his grasp. “ Upon this, another gentleman thrust the end of a small spatula at the under side of it, to prevent it from slipping under the skull, and likewise with a view to turn it out ; but he was likewise disappointed. After all these attempts, the piece of bone, to our great satisfaction (says Mr. Hill), was found sticking in the head of the trepan. What, by candle-light, seemed to be the bone, was only the white dura mater, with a red circular pricked line upon it, occasioned by its pulsation against the teeth of the saw, during the slow working.

“ When we began to recollect ourselves, we could not but smile at the ridiculous panic we had been

thrown into, and that so many people should have been under the same deception, which was owing to the dura mater's subsiding so far."

"A red circular pricked line upon the dura mater" of a living person! With whatever air of indifference this may seem to be related, I intreat that it may make no other impression upon your minds, than as an act of imprudence not to be pardoned; though that operator smiled, you I hope will be serious, for I do sincerely believe such a wound, in its most usual consequences, the most deadly that a rash hand could inflict *.

Secondly, But this first suggestion is inconsistent with a rule much more worthy of notice; viz. that "in all circumstances the surgeon should saw cautiously, on account of the incalculable irregularities in the thickness of the cranium, which is universally thin in boys and very aged people, and is, during all the middle stages of life, extremely irregular, generally thick, but at certain points extremely thin, or excavated by the deep impression of tortuous veins." I approve of sawing the cranium, in all circumstances, with prudence and deliberation; but yet I discover, in all these rules, intrinsic marks of their having been invented by mere speculators in surgery, not by surgeons; and in the cases I have just related, I find

* Such rashness is, I fear, not very rare, and many have thus injured the dura mater, for one who has the honour or courage to confess it. "I remember," says Turner, "that in the first little one I trepanned, an accident of this kind befel me, and put me, as well as the warden who stood by me, into great consternation; for, missing the piece, we were fearful, finding a rent in the crassameninx, that it was fallen in upon the brain; till, further recollecting, and taking up the instrument I had been working with, I found it fast shut within the bone."—TURNER, p. 238.—Fast shut in, because they used crowns of a conical form.

proofs of Turner and Hill's busy trepanning where there was nothing to vindicate so decided a measure ; for in truth we almost never operate in a mere fracture of the skull ; we almost never operate where the bone is sound, and the dura mater closely attached to the bone ; even in cases of extensive fracture, we operate only on account of some affection of the brain. The dura mater, for example, has by the shock been separated from the skull, widely separated, and a quantity of grumous and black blood lies betwixt the dura mater and skull ; or, the bone having been deadened by a blow, has lost its circulation, a tumor has arisen over the injured part, the patient begins to complain of sickness, languor, trembling of the hands, and confusion of head, which shows that pus is forming upon the surface of the dura mater, and oppresses the brain ; when we cut into such puffy tumor, we find the bone dry, discoloured, and without circulation ; and when we apply the trepan, the matter flows through the trepan hole from under the cranium. Thus the connexion of the skull with the dura mater is dissolved, pus or coagulated blood fills the interval, and (though we should in all cases operate deliberately and cautiously), in very many cases, the dura mater is depressed by blood or pus, and is in no danger.

Thirdly, The artery of the dura mater is described with a particular reference to the operation of trepan. " As an artery of considerable size, the chief artery of the dura mater, running along the inner surface of the parietal bone, marking the anterior corner of the bone with its trunk, and the upper part with the impression of its branches, and making a groove so deep, that the bone cannot be entirely cut through

by the trepan, without the artery being divided. For these reasons it is advised, that the surgeon should avoid the whole tract of this artery, and especially that he should not trepan the lower corner of the parietal bone." That the surgeon should, except in cases of the most absolute necessity, avoid even the shadow of danger, is a precept from which I will not allow myself to dissent. But in this, as in all these notable observations on the cranium, there are strong intrinsic marks of the reflection coming from one little acquainted with practical surgery; for in all circumstances, and on all points of the skull, have I seen the trepan applied without much skill, or any thing of this foresight, but never have I seen or heard of a hæmorrhagy from the artery of the dura mater.

In all cases it must be, that either the dura mater is detached from the inner surface of the skull, or it is not detached! If the dura mater be detached from the skull, and you apply the trepan on account of extravasation, the artery, as it belongs to the membrane, must be depressed along with the membrane, the interstice being filled with blood, and the artery entirely removed from the reach of the instrument. If the dura mater be not separated, and you are using the trepan on account of mere fracture, and with the design of cutting away those points of the fractured bones which might injure the membranes, or for raising any depressed portion which may oppress the brain, even if you did touch the artery of the dura mater, there could be no great nor dangerous hæmorrhagy. The artery is small, there is no cavity nor cellular substance to hide its bleeding orifice; it must appear at the edge of the trepan-hole, and must

cease bleeding spontaneously, or be stopped merely by applying a little bit of lint, pressing, at the same time, slightly with the point of the finger. Therefore, although much has been said about this dangerous artery, lodged so deep in a groove of the parietal bone, although the French Academy actually invented an instrument with two blades screwed together, one of which was to be laid under, and another above the bone ; or proposed, in place of this, to use a piece of sheet-lead, which, being cut into a proper shape, was to have one end laid under, and the other doubled over the bone ; whatever ingenious remarks, or cunning instruments, may have been imagined for suppressing this kind of hæmorrhagy, I believe the whole to be a speculation of the closet, such hæmorrhagy being extremely rare.

Fourthly, You are warned of the danger of wounding another important vessel, which has greatly alarmed these busy speculators,—the Longitudinal Sinus *. You are told, “ that the longitudinal sinus is the greatest vein of the brain, named longitudinal from its running along the whole length of the skull, and changing its name at the occiput, where it forks into the branches which terminate in the great jugular veins, and are called the lateral sinuses.” When physicians were framing conjectures, and amusing their pupils at lecture, or adorning their books with observations, this conspicuous blood-vessel could not escape observation ; it was never doubted, that the wounding a vein which conveyed so vast a proportion of the

* Speaking of the longitudinal sinus, De Goerter says, “ Ex quo si rumpitur, funesta sanguinis profusio oritur.” And this is in the *Chirurgia Repurgata*. Heister says, “ Qui facile, ac non sine magno periculo, hic læditur,” —“ quem percurrere pestiferum est.”

blood of the head must be fatal ; and that this conjecture might lose nothing of its value, it was set down as a very absolute rule, “ that the skull should never be trepanned in the line of the sagittal suture, under which this sinus lies.” You are told that such wound is fatal.

This is none of the surgeon’s rules, who, if he had at all mentioned the longitudinal sinus, would probably have observed how sluggishly the blood moves along in this great sinus ; that it is more properly a reservoir than a vein ; that there surely could be little danger in wounding it ; that often when we find it necessary to operate in the direct course of this canal, we feel it turgid under the finger, that in such a case the temptation is too strong not to be yielded to, of striking the bleeding lancet into it, with the hopes of relieving the patient from the lethargy in which he lies. Warner and Pott have both seen the longitudinal sinus punctured by fragments of bone, and the blood flowing from it profusely, which was yet more easily stopped than that flowing from a vein, merely by applying to it a piece of dry lint. Pott and Warner have both, without scruple, opened the sinus with a lancet, and bled the patient from it. Calisen, the celebrated Danish surgeon, having trepanned a sailor who was knocked down by a block falling from above, felt the sinus lying turgid under the finger, and seeing no prospect of the oppression in which his patient lay being relieved, bled him from the sinus with as little concern as he would have done from the jugular.

Calisen, like other innovators, having fallen upon this trivial observation, was resolved that it should lose nothing of its value, and accordingly he had the

confidence to propose, that in epilepsy, madness, delirium, and in high fever, the skull should be trepanned, in order to reach the longitudinal sinus; but we have not heard that any surgeon has chosen to distinguish himself by an experiment of this kind*.

Fifthly, I am now to speak of a rule more purely hypothetical than any I have yet commented upon. The dura mater was supposed by the ancients to pass through the skull by the indentations of the sutures, not merely to connect itself with the pericranium, but to form that membrane, and from thence was supposed to be derived all the membranes of the body.

The name of *Crassa Meninx*, or *Dura Mater*, was derived from this imaginary office of forming all the other membranes, and the surgeons were advised not to scrape the sutures with the *rugine*, nor trepan near them, lest he should injure this most important connexion. The reasons given for avoiding the sutures, had no manner of relation to surgical practice, and could have no origin but in the capricious imagination of mere speculators. “*Vitandæ sunt suturæ*,” says Fabricius†, “*quia per has dura mater exit ad pericranii generationem*.” But there is a reason, worth taking notice of, why they apprehended so much danger from approaching the sutures, or injuring the pericranium, viz. the singular nervous symptoms which sometimes ensue after a mere wound

* Being told that a patient died from the bone penetrating the sinus, and that it was not possible to stop the hæmorrhage, I asked if the patient had been raised into the perpendicular position; the narrator was confounded, for he saw, too plainly, that the blood of the body could not be drained by the wound of a vein at the upper extremity of the column.

† § 725.

of the scalp, without any the slightest injury to the bone, or to the brain. The nature of this affection I shall afterwards explain; at present it is natural to remark, how well the doctrines of the old surgeons agree with these facts. Guy de Chauliac, for example, having conned over the aphorisms and descriptions of Hippocrates and Galen, and enriched his imagination with some of the notions of Avicenna and Albacasis, describes the pericranium thus: “De grosso panniculo quem Galen vocat pericranium, qui cooperit totum cranium, est sciendum, quod est nervosus, et oritur a dura matre, et ligatur ab ea, ligamentis, nervis, venis intransibilibus et exeuntibus per commissuras cranii,” “et jungantur ossa cranii cum commissuris serratilibus, ut vapores ab ipso cerebro valeant expirare*.” The opinion was universal. Columbus says, in his Anatomy†, “Provida natum perforatam esse, voluit calvariam variisque suturis distinctam ut purgando acrementis cerebro nusquam occasio deesset.” Numberless are the examples he has retailed of good old folks tortured with megrims, for no other cause than this purgation of the brain being suppressed; and he imagines he proves this by finding, in dissection, their sutures either obliterated, or very close. “Inde collige,” says Mangetus, “capitis suturas ad valetudinem non parum conferre.” In Poland, the sutures are said frequently to have burst from the savageness of the plague; and a tale is told in Bonetus‡, of a German colonel, who drank one day of Luttenburgh wine, till the sutures of his skull cracked and burst; but then he had the advantage, that from this time forward he

* Page 12.

† Lib. i. cap. 5.

‡ Page 52.

could drink without stint or measure, like the Scandinavian Hercules, who drank on, and would have drunk for ever, to win his wager, if he had not observed that the other end of his drinking-horn was in the deep sea*.

The surgeon is called upon to remark the peculiar firmness with which the dura mater adheres to the sutures, and counselled not to apply the trepan exactly upon a suture, when the dura mater adheres so, but on each side of the suture, so as to be thus sure of finding the extravasation. But I no more find this adhesion capable of limiting extravasation, than the sutures capable of stopping fractures. I find the extravasation always extending beyond the place of the sutures, and covering, very generally, one entire hemisphere of the brain. I never saw any occasion for applying the trepan, first on the one side, then on the other side of the suture, though much has been written on this subject. I find in no book a proof of extravasation having been limited and interrupted by intervention of a suture, nor one case unequivocally stated, where the surgeon, having applied his trepan on one side of a suture, was obliged to repeat his operation on the other side.

Sixthly, In describing the frontal bone, its internal spine or ridge running longitudinally along its inner surface, is pointed out as particularly interesting to the surgeon, as being an absolute bar to the perforating of that part of the bone. The observation seems important, the difficulty seems demonstrable; but this, though it be a difficulty which must naturally present

* Mallet's Northern Antiquities.—It was Columbus that alarmed the medical world with this apprehension of painful and fatal consequence arising from the closing of the sutures.

itself to the imagination of the speculative anatomist, is one which can have but a slight influence over the resolution of the practical surgeon. Though a well instructed surgeon will not fail to recollect this internal ridge of the os frontis, he will nevertheless perforate here when the operation is required at this point, with this sole precaution, that he will saw more circumspectly, will cut through all that he safely can of the circle, burst up the rest, and smooth the ragged edges of the hole. It is only in one single point, at the very root of the nose, at a point considerably lower than we ever need to perforate, it is only in the very middle betwixt the brows, and in a space no bigger than one crown of the trepan will cover, that this spine can at all prove an interruption. I know no mischance, by which the most ignorant person could be induced to apply the trepan so low, and believe that there is more danger of a thoughtless operator doing harm when trepanning upon the ridges of the occipital bone; but in neither the one place nor the other is the trepan required; of an hundred cases in which this operation is required, the instrument is placed in ninety-nine cases upon the upper parts of the skull, upon the parietal or frontal bones*.

Such are the conjectures of the speculative anatomists, deduced from the anatomy of the naked bones, and relating to the operation only, and not to the disorder produced by the blow or fall. These are named the interdicted points of the skull, as if

* Whether the temporal muscle should be cut, was long and violently debated, and the veto of the physicians was very absolute. Thus Musitani; and Hippocrates says, "*Quibus tempora secantur, convulsio in contraria parte oboritur.*"

the surgeon were to be restrained from performing the most important of all operations from such slight considerations ; these were yet the best and most important lessons they had to offer ; they were instilled into the mind of the student to this day with particular diligence, and he never suspects them to be trivial, till he finds the daily occurrences of every hospital give the lie to every one of these rules. That I may not seem to treat with levity or severity the wise and sober directions of the ancients, or the servility of modern writers, I shall make some more deliberate remarks on the operations upon the lower part of the forehead.

The rules which I deprecate, often incline the young surgeon to deviate from the plain way of common sense, and, by avoiding imaginary, he runs into real dangers. To understand the case I am now going to relate, you must assent to one principle, which I shall afterwards prove in the most unequivocal terms, and it is this,—“ That mere depression of the skull, which was once believed to be the most perilous of all accidents, has really but a very slight effect in compressing the brain.” The line of a depressed bone deviates but in a very slight degree from the natural convexity of the skull ; the depression, as such, produces no compression, for the patient walks about unaffected, or but very slightly ; and if he falls into a dangerous state, it is indicated by tremblings of the hands and knees, a sort of imbecility, slight shiverings, and nausea, which are signs, not of compression, but of matter, or of ulceration of the brain, or its membranes. The bone itself is sometimes deadened by the blow, or its spiculæ and fractured edges stick in the membranes, and occasion

suppuration ; while the integuments continue entire over a fractured bone, the interstices often are filled with extravasated blood and gluten, and soon become vascular, so that the bone reunites, as in the fracture of a limb, and the brain and its membranes remain sound ; but if the integuments be much injured, and the depressed and fractured bone exposed, ulceration is apt to ensue.

W—— L——, a chimney-sweep, fell from the third story of a house, upon a street paved with very coarse round stones ; though he had sustained a very dreadful fracture of the skull, he was very little affected, and not brought into our hospital till eight days after the fall. The clerk, or surgeon, far from expressing an alarm either at the nature of the accident, or the peculiarity of the symptom, described the case thus in the books :—“ He has, on the lower part of the frontal bone, a fracture in the form of the letter V, about an inch in length, and with a spot of the cranium, which you could cover with the point of your finger, bare, but without any mark of depression.” By marks of depression was meant, perhaps, “ signs of oppressed brain ;” for, though he had no such signs, the depression was great, and was easily distinguished by the finger or the probe. When I first saw this man, he was sitting up in bed, submitting to the operations of the dresser, talking rationally, and apparently little injured ; and I was told that I might, if I pleased, feel a fracture pretty distinctly, but without depression, and that the patient was in no danger.

I formed a different conclusion from every circumstance of his case. The height from which he fell was very great ; he had fallen perpendicularly upon

the forehead, else it could not have been fractured, and he had not broken, nor even sprained, a wrist or ankle, so that there was no intermediate shock to break his fall. He was, indeed, sitting on the side of his bed, but extremely meagre, sickly, pale, languid, and dejected; his eye was sunk, his cheek hollow, and his face somewhat distorted with spasmodic twitches. Upon opening the lips of this triangular wound, which was now suppurating, and puffy, I found that the fracture, seated exactly in the middle of the forehead, was very wide, and that the bone at the lower part of the fracture, and immediately over the eyebrow, was much depressed; and, worse than all, I found the bone so completely discoloured, that though the depression did not infect the brain, the caries, I was sure, would, in process of time, affect its membranes, and cause suppuration. That the fatal symptoms were begun, I was convinced, by a more deliberate examination of his nurse and attending friends; for, though he sat on his bed, bore the perpendicular posture, and suffered the operations of the dresser; though he answered pertinently to all our questions; his articulation was slow, his motions languid and listless, his eye oppressed, his breathing anxious, and accompanied with sighing. There was a sort of sardonic grin, or distortion of face, and a silliness or fatuity of look. His pulse was quick and irritable, his tongue parched; he had a hectic flush upon his cheek. Though he made no complaint, he was sickly, his hands trembled, he vomited frequently during the night. He was always slightly delirious during the night, before he was thoroughly roused; and during the day, he walked round his bed, fumbled about the clothes, seemed to wish to do something,

yet had no purpose. In short, he was in a state of indescribable disorder, never soundly asleep, nor entirely awake ; and, though his sickly condition conveyed no intimation of approaching danger to his ignorant friends, it could not but be observed by his medical attendants ; for these are the signs, slight as they appear, which announce suppuration within the cranium, and approaching palsy.

A consultation having advised that the patient should be trepanned, the operation was performed with such circumstances of misconduct, as I think very impressive and instructive. There was a large transverse fracture across the lower part of the frontal bone, with one limb extending into the orbit. The lower part of the bone, above the frontal sinus, was depressed the full thickness of the bone, and the depressed portion of the bone was plainly carious, black, and dead. Unhappily the rules of surgery, which the operator but too well remembered, and applied too accurately, were in every thing opposite to the dictates of good sense. The rule says,—“ Apply your trepan upon the sound bone, which can best bear it, that you may be able to press your levator under the depressed bone through the trepan hole.” But common sense directs no man to cut away a sound and living portion of the cranium, to save by elevation a part which is depressed, and perhaps dead. The rules of surgery say, “ You shall not trepan on or near the frontal sinus ;” while common sense requires the surgeon to perforate wherever any cause of danger exists. The rules of surgery would impress us with the belief, that “ of all the accidents of fracture, depression of the skull is the most fatal cause of compressed brain, and the

one which most immediately requires the operation of trepan;" while this very case, combined with a thousand collateral proofs, shows how slightly the greatest depression of the cranium affects the functions of the brain, for fifteen days had elapsed before it was distinctly known that the bone was depressed, or the man in danger.

Though the depression of the skull was, in this case, the circumstance which should chiefly have attracted the attention of a tyro, thinking only about the anatomy of the skull, and imagining nothing more correct or absolute than these mechanical rules, the carious or dead part of the bone affecting the dura mater as a foreign body, would alone have appeared important to one who reasoned on the affections of the brain, and knew them by their signs. The one would have thought only of elevating the depressed portion of bone, the other of cutting away whatever was dead. The one would have applied the trepan upon the sound bone, the other would have applied it upon the injured part.

Resolved to perforate as far as possible from this formidable sinus, the frontal sinus, the operator, instead of elongating the triangular wound of the integuments downwards, prolonged it by incisions upwards, and applied the crown of his trepan upon the sound and undepressed bone above the fracture. The os frontis was extremely thick, like that of a rachitic person; in avoiding the frontal sinus, he encountered the frontal spine, and was, though it may seem incredible, fully an hour in accomplishing the perforation, the patient all the while crying out, struggling, and taunting him with expressions which I thought he very well deserved. But, after having

sacrificed this sound part of the skull in favour of a part carious and irrecoverable, he found the depressed portion not only well able to bear the working of the trepan, but so exceedingly firm, that no force of levers could enable him to raise it. The operator, conscious that he had by this perforation done nothing effectual for the relief of a patient who had endured so much, was now willing, after an intermediate consultation, to attempt what should have been done at first. The incision of the integuments was carried downwards through the eyebrow, to the root of the nose; the whole extent of the depression, and of the deadened portion of the bone, was now displayed. The fracture was seen running down into the orbit; the operator would have now applied his trepan upon the depressed portion which should have been first cut away; but, after operations and consultations lasting an hour and a half, the patient, exhausted by his cries, resistance, and loss of blood, the manifest inhumanity, too, of continuing such unavailing cruelties, induced the surgeon to commit his patient to bed, where his rest was long and sound. What he suffered afterwards I had not the courage to inquire, but he died.

This would be a long, impertinent, malicious tale, were it not related without names, and for the best of purposes, to prove to you, that those conjectures, dignified with the name of rules, which you might imagine were the most incontrovertible, and useful discoveries in the profession, are the most to be suspected.

The alarm about wounds of the frontal sinus has been universal; the injunctions not to approach it with the trepan have been transcribed from book to book, in the same unvarying language. After such

prejudice has prevailed for ages, and authority been accumulated upon authority, we cannot become all at once familiar with the idea of trepanning a fracture, or opening an abscess in this part as freely as we should in any other. This cavity, which is formed within the inner end of each superciliary ridge, betwixt the two tables of the frontal bone, is the first of that great train of cells which occupy all the space betwixt the cranium and the face. Its place is marked by the bump or prominence on the forehead, from which the root of the nose springs, and is very generally proportioned to the degree of prominence in that part. The frontal sinuses of each side usually communicate with one another by small round openings, and always with the nostrils, unless when the communication is interrupted by disease. These, like all the other cavities, are lined with a delicate and sensible membrane, extremely vascular and subject to disease. But that fractures of this part should never heal, that trepanning this part was not merely difficult, (for that must be allowed), but full of danger, is a conjecture which could have come into the imagination only of those who were more familiar and more delighted with the amusing conjectures, than the instructive labours of actual practice. Monsieur Palfin, a celebrated surgeon of Ghent, the first who had the good sense to think of surgical anatomy, or to decorate his book with this attractive title, was yet not superior to the vulgar prejudices in relation to this part. "I think it right," says Palfin, "to warn the surgeon not to apply his trepan upon the frontal sinus, for the opening will remain fistulous, nor to mistake its lining membrane for the dura mater, nor its mucus for the substance of the brain." We can-

not wonder to find such errors universally received, where Fallopius, at once the greatest anatomist and practical surgeon, assures us *, that wounds of these sinuses never heal, and adds his authority as a surgeon, “That he never saw such a wound close, except once in a child, in whom the cavity filled up with a spongy sort of granulation.” A remark or conjecture rather obtruded upon us as a fact, is at all times disgusting; and in this Fallopius is most unfortunate, since in a child, neither the frontal sinus, nor any other bony cavity is yet formed. But it was the custom of these theorists to repeat and multiply their conjectures till they themselves believed them facts. Of this passion for conjecturing what consequences should follow a wound of the sinus, there is not a more conspicuous example than the tale told by Palfin, about the apothecary of Louvain! “In the year 1701, I saw an apothecary at Louvain, who having been wounded some years before in the left frontal sinus, was, notwithstanding the loss of bone, cured, the wound having healed up all but a small round hole, sufficient to admit a pea. When this hole was left open, the air escaped through it with a force which I felt very distinctly on my hand; and so much was he oppressed when the air escaped thus by the hole, that he was obliged to plug it up with a tent, and fix the tent down with a strong adhesive plaster. His breathing was oppressed, no doubt, from the air which should have served for respiration escaping by this hole, without passing round the lungs, which have occasion for a constant circulation of air, to heat, attenuate, and subtilize the blood,

* Cap. xii. De Vulneribus Capitis.

and render it fit for circulation." That this unfortunate apothecary may have had very hypochondriacal feelings, and been at times overcome with the sensation of the air passing out through his forehead, "*et qu'il se desesperoit de pouvoir vivre long temps avec cet overture,*" is indeed very possible, but that he was hypochondriacal enough to feel and be anxious, and that Palfin had credulity enough to believe him dying for want of air, chiefly because there was an additional hole for inhaling air by, is all that we can learn from such a case. No philosophy, and far less this of Palfin's, about the subtilizing of the blood, can account for the ill effects of such a hole ; for to the lungs and to the blood it signifies nothing, if air is but inhaled, whether it comes through the nostrils, or through the mouth, through an opening in the trachea, through a hole in the fore-head, or, if it were possible, through a hole in the back-head. The apothecary was more unfortunate in his knowledge and art, than in his ignorance and credulity ; for had he left off those tents which were so fashionable in those days, the opening would have closed of its own accord.

The following case is related by Gooch*.

"Professor Monro speaks of a person, who, in an engagement with a privateer, received a wound upon the middle of the os frontis ; which, although it was soon healed apparently, yet left a continual pain of the part. Some time after his return home, the wound broke open, upon which incident the pain abated, but a deep and extensive caries was found in the bone by the professor, to whom he applied, after having been

* Surgical Observations, p. 269.

under the care of other surgeons to no purpose. The carious bone was not black, but of an ash-colour, and full of small, like worm-eaten holes, and the discharge was large, ichorous, and very foetid. This practitioner of great discernment was apprehensive that the caries penetrated at least as far as the diploe, about the breadth of the palm of the hand, which he easily raised from thence, except in one small space, where he left it to exfoliate; and cured his patient, after this operation, by the common treatment."

Not one word of which is true, so help me God! and Professor Monro, who is a man of strict honour, of strong and manly sense, diligent in observation, and whose good advice I have often profited by, is, I am persuaded, incapable of relating the case thus, either in conversation or in lecture. My worthy master, Mr. Wood, performed the operation, and I was at the time his apprentice. This gentleman was captain of a French ship, which he defended very gallantly, and in the engagement, which was very close, he received a pistol-shot in the forehead, betwixt the two superciliary ridges. His ship was captured in the mouth of the Clyde, and thirty days after he received the wound he was brought to this city. The ball was sunk in the hollow of the frontal sinus, and the integuments almost closed over it; and though the ball could not be distinguished by its colour, you could perceive by the probe that some foreign body was lodged there. There was no supuration round the ball, no shiverings, languor, oppression, nor other symptoms of injury of the brain; he was lively, spirited, and resolute, and sat himself down on a pillow, and laid his head with great composure betwixt Mr. Wood's knees to have the trepan

applied, nearly in the same posture in which a dentist places his patient, when preparing to draw a tooth. The small and circular wound, or fistula, for it was now callous, was enlarged by an incision right down the forehead, and to the root of the nose. The ball was seen nitched in betwixt the fractured edges of the bone. There was little bleeding to retard the operation; a crown of the trepan was applied of so large a circle as to include the ball and the wounded part of the cranium. A ball driven through a bone is flattened and ragged, and generally fixed under the fractured edges, so that no lever nor forceps can poise nor pick it out; and generally, as in this case, what you see projecting from the wound of the bone is but a fourth part of the actual size of the ball. The ball and the surrounding plate of bone were cut out, and the posterior part of the sinus being shivered, the splinters were seen lying flat upon the dura mater, which was neither wounded nor inflamed; these were picked away with a silver prebe, the wound lightly dressed, and the gentleman was cured, without one moment of ill health from this formidable sinus, though both wounded and trepanned.

Ravaton, army-surgeon under the warlike reign of Louis XIV., mentions a similar wound in a foot-soldier of the regiment of Condé, who was shot at the battle of Dettingen, right betwixt the eyes. "The wound seemed at first," says Ravaton, "full of danger, for the soldier assured me that the musket-ball was lodged; and it is difficult to imagine a musket-ball lodged in a cavity so small as that of the frontal sinus, without breaking the posterior table, and touching the brain. I believe the ball lodged actually in the brain (says Mr. Ravaton); I searched

with my probe, but found no outlet from the sinus. At last I discovered the ball, encrusted and completely flattened, lodged in the lowest and widest part of the frontal sinus ; and I extracted it without either incisions or trepanning, and along with it seven splinters of the bone. The wound was dressed simply with plucked charpie. The suppuration began on the fourth day ; it soon became very profuse, which was the prelude to the discharge of some other fragments of bone, which being loosened, the discharge lessened, the wound healed, and the sinus was closed to a very small opening, from which a watery exudation continued to flow, even to the time of his leaving the hospital, which was three months after the battle :” here we have another wound not less desperate probably than that of the apothecary of Louvain, followed too by the operation of trepanning, without any want of breath, or danger of dying.

Never having been accustomed to indulge these irrational fears, I trepanned this sinus in a case of general convulsion, singular in all its circumstances, and not uninstrusive, but especially in this respect, that it was plainly connected with a disease of the frontal sinus.

“ A very tall, well made, and handsome lad, about twenty-four years of age, a house-carpenter in Appleby, while assisting his fellow-workmen in laying a heavy beam upon the frame of a saw-pit, slipped a foot, and falling forwards, had his head immoveably wedged betwixt the beam which they were lifting and that which had just been laid upon the frame ; and so heavy was this log, that his companions were obliged to take their hand-spikes and poise it up. He cried out during the time his head was wedged be-

tween the logs, and when released was able to rise ; though giddy, he was not insensible ; nor did the blood burst from his nose and ears, as might have been expected after such an injury.

“ Though his head suffered this pressure on the sides, being compressed from temple to temple, there is every reason to believe that the forehead had suffered, and the frontal sinus been injured ; for he walked home under the agony of an acute head-ache, which soon, however, subsided into a heavy, dull, and continued pain, aggravated at times, but never entirely absent. His head was confused ; he gradually lost his hearing, and by the third week from the time of the injury was entirely deaf : he returned to work, but his head-ache, giddiness, and deafness, were unremitting, and he had occasion to remark, that ‘ he never, from the moment of that bruise, had a good head for standing or working in any difficult places.’

“ The sudden manner in which he regained his hearing, and the profuse flow of matter from the ears and nostrils, which opened the passages, are very remarkable. It happened about a fortnight after losing his hearing, that while he was working in the fields, upon blowing his nose, there rushed out from one ear a great quantity of matter, with a painful noise. He fell down by the wall in a sort of fit, lay for some time insensible, and when his senses returned, he was as much surprised at hearing the barking of dogs, and the voices of the people in the neighbouring village, as if he had been born deaf. He now found that matter was flowing from the nostrils, as well as from the ear, with a smell so offensive, that at first he imagined that his hat in his fall must have lain in some foul place. He smelt his hat first, and looked

to it, but found it not soiled, nor foul; and upon blowing his nose, there run out into his handkerchief a profusion of foul and very foetid matter, mixed with blood.

“ When he had fully recovered his senses, he found that the discharge of blood and matter from the nose was accompanied with agonizing pains in his head: he retired to the shelter of an unfurnished house, where his companions had been working, and threw himself down on a bed-frame, and lay there alone till evening, with his head hanging over the bed-frame, a black, foetid, and bloody matter distilling profusely from his right nostril, while an acute and confused pain ran through his forehead. He got up after some hours, and walked to his father’s house, about a mile distant, in great pain and confusion of head.

“ From this time the pain in his forehead was unremitting and severe, and when heated at work, it was particularly violent*. This pain at the root of the forehead was aggravated at times to violent paroxysms; it affected the eye, puffed up the eyelid, swelled the whole side of the face and forehead. The discharge from the nose continued very profuse, and this local disease, accompanied with general headaches, afflicted him for five years, and a permanent bony swelling, marked by a very conspicuous protuberance of the right eyebrow at the place of the frontal sinus, was formed.

“ But his complaint underwent a sad revolution in consequence of a second fall, which happened thus: After mowing hay in weather which was oppressively

* He recovered, about a fortnight after this, the hearing of his other ear by a like discharge of matter, which also happened suddenly upon blowing his nose.

hot, he retired with the other labourers at mid-day, to rest in the hay-loft; being overcome with labour, and having fallen into a perturbed sleep, he, by successive restless motions, got so near the edge of the loft, that he at last slipt over. One of his fellow-labourers chanced at that moment to observe him sliding, and ran to catch him by the feet, but too late, for he fell from the loft headlong, upon a rugged pavement of big round stones, and alighted exactly upon that part of the forehead which had been long the seat of disease; for I find the scar of the wound which he then received, just over the bulging of the right frontal sinus. He lay insensible during a quarter of an hour, and when he revived, he felt sick, faint, and languid; and his companions being gathered about him, he waved his hand as for room, and a freer breathing space. They carried him into the open air, where he instantly fell into an epileptic fit, which epilepsy has continued ever since.

“The epileptic paroxysms returned frequently, at least every night and morning, from the time of this fall. He was weakly, almost paralytic, walked only with the help of stilts, and trailed his limbs along. In about five weeks he had so far recovered, as to think himself strong enough for work, and the paroxysms, which had at first recurred three or four times a day, became less frequent, ceased at last, and were absent entirely for a week. Thus encouraged, he returned to his daily labours, and by the violence of his labours the fits came on again. He had been now six months labouring under this disease, is reduced, weakened, and dispirited; is distorted with these fits of spasm or convulsion twice a day at least, and tormented from hour to hour with severe threat-

enings. Fits so peculiar, and proceeding from so unusual a cause, I think it right to describe with particular care.

“ The convulsion is distinctly connected with the disease of the forehead. The approach of each paroxysm is announced by pain of the forehead, with a sense of fulness ; first his jaw begins to shake with a trembling, and convulsive motion, and the tongue, too, trembles, and is retracted into the mouth. This is the warning or first alarm of the approaching paroxysms, which sometimes, as he imagines, he prevented by clenching the jaws, and holding them firmly. Being once attacked when reading, he, in hopes of stopping the convulsion, thrust the book into his mouth ; the convulsion increased, and was as usual propagated along the neck, arm, and side ; the book was so fixed by the convulsion of the jaw, that he had no power to withdraw it, and the suffering was so dreadful, that he remembers having howled with agony.

“ But the convulsion only begins in the jaws, then trembling and convulsive motions run downwards along the neck ; his head is turned to the right side, while his neck is tortured with the spasm ; the convulsion descends from the neck down the arm, and to the hand, which is clenched and contracted, till the whole of the right side is affected with it.

“ Besides frequent threatenings, and incessant fear, he has three or four regular paroxysms during the day. He is warned of its approach, like those who have the aura epileptica, by slight distortions of the parts, and a confused sensation in the forehead ; he immediately clings to a bed-post, a chest of drawers, a door, or some firm body, continues sensible, and

feels all the horror of its slow approach, and all the pains of the convulsion ; and the perpetual fear of this attack has given his countenance an anxious, subdued, and melancholy cast. First in orderly succession, comes the pain and fulness of the forehead, then the tremblings of the jaw and tongue, then the sore contraction of the neck, which draws his head over the right shoulder, and then successive cramps and convulsions of all the right side of the body, till it is bent down ; and in this state of agony he continues four or five minutes, when the muscles of the side of the arm and of the neck gradually and successively tremble, and fall into a quiescent state, and the convulsions of the neck and arm having remitted, the spasm of the jaw and trembling and retraction of the tongue also cease, and then he returns slowly to his seat. He is always in great confusion, but never insensible, during the fits, unless it be during the night ; for it would appear, that during sleep he is seized with fits more nearly approaching to the nature of true epilepsy. He passes his fæces and urine involuntarily during the night. His disease has, if not the express form, at least the effects of epilepsy ; for his faculties begin to fail, his memory is injured, certain words he is unable to pronounce, and pronounces them with a painful and convulsive hesitation. Although he does not actually fall down, his confusion during a paroxysm amounts almost to insensibility, and each paroxysm is followed by drowsiness and a degree of oppression, so that very commonly he falls asleep, his right eye is turned obliquely inwards, the swelling of the frontal sinus over it is very prominent, and gives an obliquity to the whole countenance ; the matter which runs from the right nostril only is in

great profusion ; it is partly glairy, partly purulent, amounts to two or three ounces in the day, and sometimes entirely fills a bleeding palate *. His speech, especially after a paroxysm, is slow, difficult, hesitating, and interrupted. When pain of the forehead comes, and is not followed by convulsions, he has a general feeling of weakness, as if all his joints were loosened ; he trembles, and his knees shake under him, and he has a trembling and paralytic feeling in the arm.

“ This is the whole state and condition of this young man, who, from uncommon health, and bodily strength, is reduced to great weakness and despondency ; and since the first signs of the paroxysm are distinctly referable to the frontal sinus, and since the convulsion affects the same side of the body with the injured part of the head, are removed all suspicions of its arising from any disorder of the brain. I have resolved (encouraged and supported by the unanimous voice of the consulting surgeons) to trepan the sinus, hoping, by curing this ulcer, to remove a possible cause of disorder. The dismal situation, and earnest intreaties of the patient, are arguments too powerful to be resisted ; and the operation, though unusual, is no rash enterprise, but, on the contrary, entirely void of danger.

“ I laid open the diseased and much enlarged sinus with an incision of little more than an inch long, and perforated the bone, which was of such thickness, that the assistants believed that I had mistaken the case, and pierced, not the outer plate of the sinus, but the whole thickness of the skull ; and they plainly

* Containing from four to five ounces.

said, that the membrane now exposed was not the lining of the sinus, but the dura mater. But it was merely the lining of the sinus; the injections passed from this small trepan-hole into the throat and nostrils, and the patient could at pleasure draw it back again through the trepan-hole. By a little skill and practice, and by inclining the head of the patient properly, the dresser soon learnt to direct his injection, so that the whole of it flowed out by the right nostril. The lad continued under my care for three months, and I injected the sore first with barley-water, then with solutions of vinegar and honey, then with tinctures of bark and myrrh, and finally with tinctures of corrosive sublimate and crude sal ammoniac; but (as I must confess) without the slightest alteration on the matter (which ran profusely from the nostril), or the slightest improvement of his health. Despairing of doing good, and wishing that he should leave the precincts of an hospital not always healthy, and enjoy his native air and better food, I sent him home, having first withdrawn the tent, and healed the fistula, which closed solidly in two days, and had always been inclined to close. So untrue are all these idle tales about the danger of wounds, and the rashness of trepanning this part."

The diseases of this cavity, from blows, from scrophula, from insects drawn in with the breath, are not unfrequent, and are peculiarly so in the lower animals, which, in seeking and smelling out their food on the ground, draw in the eggs of insects, who nestle in the sinus, and produce extreme distress. Those which nestle in the sinus frontalis of the human body are usually worms of the centiped kind, sometimes red, clothed with hair, with black and pointed heads.

Worms of this kind are described in Mr. Hill's cases, in the Edinburgh Medical Essays, in Linnæus, and in many foreign journals. And so frequent are they, that often worms are suspected in cases of simple disease of the bone itself, the only affection of the part which I have at present even an apology for explaining. The following case is so purely a disease of the bone, it has so many peculiar features to mark its nature, and bears so close an analogy to that which I have just related, that I cannot refrain from giving this brief extract from my private books.

“Mr. P——, a man certainly of a scrophulous temperament, weakly health, and sallow countenance, and who has lived a sedentary life, was, when a boy at school (though healthy, strong, and active), attacked with a spontaneous disease of the os humeri, which kept him in misery for several years, the most precious in his life for attaining strong and confirmed health. This disease was, I said, spontaneous, because, though the surgeon's anxious inquiries about the cause, and his violent exercises with his playmates, induced him to say, that perhaps he had hurt his arm in throwing stones, yet he never was, at any particular moment, conscious of a hurt, and the disease was just the common scrophulous necrosis, affecting almost the whole shaft of the os humeri.

“He was a vigorous rambling boy, about twelve years of age, when he was struck rather suddenly with this pain in the arm. Under the impression of the part being hurt, a bandage was applied, which the surgeon was soon obliged to undo, on account of the great swelling and increasing pain. After this pain had continued for ten or twelve days, so excruciating that he enjoyed no rest nor sleep, a small boil

appeared above the middle of the arm, and the fluctuation of matter being soon distinctly felt, a poultice was applied, the boil burst, and there issued from it a thin and sanious ichor; nor did this sore cease to discharge for five years.

“During the continuance of this sore, many professional gentlemen were consulted, by whose advice Mr. P. passed two seasons at Leith, for the benefit of sea-bathing, and at last betook himself to Moffat, where the surgeons, examining the sinus with a probe, felt the caries of the bone, and predicted that it would exfoliate, and he should get well. He drank of the mineral well every morning, and bathed once a week, and in no long time the prognostics of his medical friends were fulfilled; for, after the discharge of some lesser exfoliations, a carious bone began to protrude through the opening, six inches long and three-fourths of an inch in breadth, but was not disengaged till a year and a half after it first appeared, at which period he had attained his seventeenth year; he disengaged the bone one morning in pulling and shaking it, which had been his daily amusement, and, immediately after the carious bone was removed, the ulcer closed, but with a very sensible weakness of the arm.

“For ten years Mr. P. continued to enjoy uninterrupted health, except that he was, during every spring and summer, affected with a cutaneous eruption; but in his twenty-sixth year, when attending the University of Edinburgh, there was an interval during which he was very weakly, languid, and dispirited. Being advised by his friends to retire to the country, he did so with great benefit to his general health. This eruption, of a very anomalous cha-

racter, sometimes suspected to be an itch, sometimes sibbens, sometimes regarded as a scrophulous disease, at others as an eruption proceeding from the heat of the season, he was entirely cured of, by a sensible and intelligent country-surgeon, using decoctions, probably of the woods.

“ After this, he recovered his health and strength, and was in good plight, when suddenly one morning he was seized with a pain so outrageous, as almost to drive him distracted ; the extreme pain in one spot, the bump of the frontal sinus, extending through the whole head. He became deaf, and the hair of his forehead fell off, but the pain soon settled distinctly in the place of the frontal sinus ; and, after about a month or six weeks of this distress, there flowed every morning regularly a quantity of matter from his nostrils, extremely foetid, so that he could not endure it, and attended with so much pain, as almost bereft him of his senses ; he felt as if his forehead would burst asunder. At first, these complaints were prescribed for by Mr. Willson, apothecary in Glasgow, who gave him large doses of physic, and certain drops to take, but without relief. He next requested Dr. Jeffrey’s advice, the professor of anatomy ; who, probably suspecting that some insect, lodging in the sinus, might be the cause of this distress, gave him an oil to be dropped into his nostril three times a day, and a mercurial powder, of which a little was to be laid upon a hot iron, and the fumes snuffed up the nostrils.

“ A year after these ineffectual consultations, and when he had just attained his thirtieth year, he again took advice, and was directed to have a seton put in the nape of the neck, which both alleviated the pain,

and considerably lessened the quantity of matter ; but, when the cord gradually cut itself out, the matter gradually increased in quantity.

“ Two years did he endure this misery, despairing of relief, and asking no advice ; but the pain increasing in September, 1800, he consulted Dr. Cleghorn, who ordered him to use fumigations, nearly similar to those which Dr. Jeffrey prescribed, and certain purging medicines, which were infused every night in boiling water, and taken duly in the morning ; and from these he found his pains sensibly alleviated, though he grew weaker daily.

“ About a year and a half after this, his nostrils were examined, with the hopes of discovering some cause for such intense pains, and so profuse a discharge ; and the report of the gentleman consulted was, that two polypi occupied the upper part of the nostrils, which must be extracted. An operation was performed without delay. About two months after this operation, Mr. P. observed, when walking in the fields, a small quantity of clotted blood mixed with the discharge from the nostrils, and on every exacerbation of pain this appearance was renewed.

“ His condition was very hopeless, when, in August, 1802, he used a course of mercury for two months, but forsook it as soon as he found it was disapproved by Dr. Jeffrey ; it was, he says, in the year 1803, in the thirty-seventh year of his age, that the swelling of the forehead first appeared. This was the period in which he first consulted me ; but I judged that the tumor, though it might have attracted his attention but lately, could not be of recent date ; it seemed to me a disease, and a long confirmed one, of the frontal sinus.

“The tumor was most conspicuous, and was a remarkable deformity, rising exactly at the root of the nose, occupying the whole space betwixt the eyebrows, separating them, extending two inches and a half up the forehead, and then gradually declining to the general level of the os frontis. A careful examination of the tumor convinced me, that the bone was greatly enlarged, that the walls or bony plates of the sinus were widely separated from each other, and probably thickened, while a softer and puffy tumor of the integuments covered the bony swelling. Perfectly persuaded, from the profusion of matter which I saw flowing from his nostrils, that this was a great abscess of the frontal sinus, and aware that the evacuation of matter through the natural opening of the sinus into the nose must be slow and difficult, especially if polypi really did obstruct the upper parts of the nostril, I foresaw no danger equal to that of the disease of the bone, extending through its inner table to the brain, and had no fear but of the matter being obstructed, and the abscess enlarged. Satisfied that the patient should not a moment delay the having this abscess opened, by cutting the integuments, and trepanning the sinus, I sent him home with this advice. Soon after his return home, from the heat of travelling, or the natural progress of the disease, his forehead suppurated spontaneously, which saved his medical attendants from the imaginary dangers of an operation, which, in a case so decided, could have done nothing but good. His own report, in a letter to his good friend Dr. Anderson, will best explain the sequel of his case.

“A short while after Mr. John Bell saw me, my brow became painful, red, and tumid. This affection

chiefly occupied the space above my nose, and along the course of the right eyebrow. The symptoms gradually increased for several days, and the pain became intolerable, occasioning general disorder of my whole body. At length the existence of matter became evident, and an incision was recommended. The tumor was most prominent above the root of the nose, and a perpendicular incision was there made, about three quarters of an inch in length; nearly two ounces of matter were discharged, unhealthy neither in smell nor appearance; a tent was introduced to preserve the opening, and it was proposed to examine the abscess afterwards. This was done by Mr. Cooper, surgeon, and by Dr. Jeffrey, separately. The cavity was found to extend upwards, and towards the right side from the opening. The frontal bone was found denuded to a considerable extent, and in one place, immediately under the external opening, a considerable portion of the external table had given way, and the probe passed easily into the frontal sinus. No air, however, could be blown from the nose through the external opening, and there was now very little discharge from the nostrils. No loose bones could be perceived; the incision continues to discharge a small quantity of matter, of a thick consistence, brown, and somewhat foetid. My general health is now, however, restored. I go about my usual occupations, and suffer little inconvenience.

“ Dr. Jeffrey thinks the incision should be enlarged, to afford a better opportunity of examining it, and to allow means to be used for facilitating the process of exfoliation. Mr. Cooper is of opinion, that the operation recommended by Mr. Bell has

been accomplished by the progress of the disease itself, no farther interference can be necessary; and that no advantage could be obtained from a larger incision. Dr. Jeffrey, not being in the way of operation, recommended Mr. Bell in the highest terms as the person most fit to perform the operation*.

“I hope, dear Sir, you will be so good as show this account to Mr. Bell, and learn his opinion with regard to the plan I should pursue, and ask him whether he thinks it right that I should come to Edinburgh, to afford him an opportunity of examining it, and remain under his care.—Write me as soon as possible, and add this obligation to the many favours,” &c.—

I adhere, in this case, to the opinion of Mr. Cooper; for, though I am persuaded that all such tumours should be opened early, yet it should ever be with a sparing hand. I advised that this sore should be lightly dressed, and little disturbed; and, to my great satisfaction, I saw Mr. P. on my return through Glasgow in the year 1803, in autumn, with an opening drawing towards a cicatrice; a small black patch covered all that remained. He had recovered his health, his flesh, and spirits; he was happy and easy, for the head-aches had almost ceased, little matter flowed from the nose, and there was the most flattering prospects of a perfect cure†.

* I do not feel that there is any true modesty in suppressing the partial suffrages of a friend whom I am so proud to acknowledge. Perhaps I am not even entitled to speak of this as proceeding from partiality; Dr. Jeffrey was probably informed of my having some years before trepanned the frontal sinus in similar circumstances.

† I have again seen Mr. P. at the distance of a year from this report. I find the outer table of the skull at this part entirely gone, the skin and the remains of the outer plate consolidated with the inner plate, and forming a remarkable hollow. The parts seem to

I am not conscious of any improper digression, in explaining thus fully the only important part of the anatomy of the skull; and I now return to my subject, and shall say a few words in conclusion upon the interesting and curious art of discovering fractures; nor is my proposed criticism without its object. The art of discovering fractures was cultivated, there is no doubt, by physicians and scholastic anatomists, who knew no useful applications of their science, who, by all the dignities of their profession, were excluded from operations except as spectators, and who sat moping and ruminating over the bare anatomy of the skull: but they have been adopted by practical surgeons, and many a time have I seen this scraping of the skull to discover capillary fractures, and witnessed the exultation with which any fissure was discovered, which might serve as an apology for applying the trepan. These ingenious and trivial observations, once adopted into the science, left no room for sensible or serious thoughts; the mind of the pupil was impressed, from the period of his very first lessons, with this belief, that wherever there was found even the slightest fissure, there the trepan should be applied. The operation of trepan seemed the greatest, the most important, the most necessary work of the surgeon; and, in performing

be solidly united, and there seems little danger of a continued caries, or of any such internal ulcer, as might affect the Æthmoid bone, or reach the brain. Except occasional twitches of something like toothache, Mr. P. has no pain. He has no megrims or internal headache. The matter which still continues to flow from the nostrils is small in quantity, and is merely mucus. A few weeks ago, he was sensible that the matter had become thinner, and changed to that brown colour which forebodes the discharge of some scale of blackened and carious bone; but the discharge is again become thick, and is plainly mucus.

it, he lay under no restraint but that of mistaking a suture for a fracture, and feared no danger, but that of performing it ill, of injuring the dura mater, of wounding some great vessel, of perforating the frontal sinus, or of encountering some ridge of bone.

In histories of cases, no expressions are more frequent than these, "We suspected a fracture," "we at last discovered a fracture," "we found a fracture on dissection, which showed the propriety of applying the trepan." But surely no expressions can be more dangerous nor displaced; nor can any thing be more improper than teaching in elementary books, in books containing the mere rudiments of the profession, and which, being first read, make indelible impressions upon the pupil's mind, the complete art of discovering fractures of the skull, as if that were the sole motive for using the trepan.

It is to learning that I ascribe the slow progress of real science, and to Hippocrates, the father, as he is named, of physic, that I refer those idle observations which have all along misguided surgeons. The subtle genius of the Greek enabled him to invent and multiply distinctions and names, to which, of all his commentators, no one has been able to add any thing new. His book, *De Vulneribus Capitis*, is not, as you might imagine, a book of prognostics, but a book about fractures, and the distinction of fractures. He is the author of many of these prejudices which now pass current for sound practical rules: "*Longe majus malum recipit,*" says Hippocrates, "*qui in osse in suturas telum recipit, quam qui non in suturas id recipit. Et pleraque horum perforare oportet. Verum ipsas suturas perforare nonoportet, sed secedendo in*

propinquo osse perforationem facere, si perfores *.” Thus was established (and what Hippocrates said was never neglected) the first great distinction of trepanning fissures, and avoiding sutures; and these sorts of distinctions and rules, the more they were commented upon, became, of course, the more conspicuously absurd: “The more brittle the bone is,” says Musitani, “the more apt to be fissured; the softer, the more apt to be depressed.” “Some distinguish a chink from a fissure, and give a fracture the same relation to a chink that a depression has to a fissure. But there are besides four principal distinctions of a chink, according to its wideness or narrowness, its length or shortness, its straight or curved direction, according as it is superficial or deep †.”

These observations of Musitani are excellent in their kind, fully as wise as those of his fellow-commentators. From such distinctions, taken from the length, breadth, or depth of fractures, fissures, and depressions, what could be inferred useful to the surgeon? So absurd were the labours of these learned men, that even Garengot was amused with their occupations: “It hath pleased the ancients,” says he, “to give high-sounding names to all varieties of fractures, so that I will give the most experienced surgeon, the man who has studied these distinctions the most diligently, fifteen days to learn and repeat their names ‡. It was in these days that so much was said about counter-fissures, about the brittle texture

* XVI. de Capitis Vulneribus.

† Musitani, p. 143.

‡ P. 114. vol. iii.

of the inner table, the tabula vitrea, and of its often giving way, while the external table remained entire."

It was easy to perceive the natural inevitable issue of such inquiries, and to foretel that this care and concern about the forms and depth of fractures would lead to the frequent use of the trepan; this, indeed, was the practice from the earliest times, long before the days of Celsus, who says, "In omni vero fisso fractove osse, protinus antiquiores medici ad ferramento veniebant, quibus id exciderent *." In every fracture, fissure, rhogme, or almost invisible crevice, it was accounted the duty of the physician to have recourse to instruments. This extravagant opinion, received on the authority of Hippocrates, was enforced in the writings of the credulous Van Swieten, and in the commentaries of Paw, the indefatigable Dutch expositor †. "Trichismus," says Hippocrates, "the most minute and least discernible of all fissures, is, for that reason alone, the most frequently mortal ‡." "All skilful surgeons and physicians agree," says Van Swieten, "in this, that a fissure of the skull is often attended with much more danger than a violent contusion, or even fracture of its bones, for a fissure is more *difficult to discover*, and often escapes the *strictest examination*, till it is too late," &c. § Fissure or fracture, or some invisible damage to the bone, was the sole danger they feared, the sole motive or apology for perforating the skull: for the rash imprudent use of instruments the surgeon was never blamed, but for its omission only; and, if a patient died untrepanned, who was found after

* Liber. viii. cap. iv.

† Hippoc. de Vuln. Cap.

‡ Paw de Ossibus, p. 82.

§ Van Swieten, vol. ii. p. 367.

death to have but the slightest fissure in any part of the cranium, within or without, it was thought that he had not come fairly by his death. With various shaped irons they not only scraped the fissure, so as to widen it, but, when there was suspicion of any thing wrong, they scraped till they got through both tables of the skull, in search of whatever might offend the *dura mater*. "Thus," says Fallopius, in his Commentary on Hippocrates, "it happened in a young man, a student, who was wounded on the head with a very heavy sword, but without the smallest chink or visible fissure, that it came, God knows how, into my head, that I ought to go down through the first table at least to the *diploe* (*nescio quomodo factum sit ut voluerim descendere in meditullium*); but having by scraping got through the outer, and reached the inner table of the skull, I there found a wide and very remarkable fissure." Yet it sounds much like affectation in Fallopius to say, that he knew not what motives fortunately induced him to go down to the inner table: the surgeons of those days never were guilty in that confession of the Litany which says, "We have left undone those things which we should have done:" they left no possible thing undone: it was the universal practice to rasp the skull wherever the slightest fissure appeared; and it was the particular precept of Fallopius himself, expressed in these words: "*Cum ergo magnum sese nobis offert vulnus, abrasite usque ad interiorem laminam* *."

So eager were they to discover fissures, that there is every reason to believe that they not unfrequently

mistook the furrows of the arteries for fractures of the skull. "I do not precisely remember," says Saviard, "at what time it was that I was called into the Fauxbourg Saint Lazare, to visit a little girl, who, having fallen into a well, had one of the parietal bones laid bare, to the breadth of a crown; and the surgeon, having observed one of those slight furrows or impressions made by the arteries of the scalp, and mistaking it for a fracture, had declared to the parents that the trepan must be forthwith applied. The parents, not daring to refuse their consent, had sent for me to assist at the operation, and to give the use of my instruments, which I granted most willingly. But the moment I examined the bone, and was conscious of the mistake of the surgeon, I carried him aside, persuaded him that there was no fracture, and that it would be unprincipled to operate, having this consciousness. However, to exculpate him from the suspicion of rashness, I said to the parents, that this fracture being capillary only, we should content ourselves for the present with applying the rugine to ascertain its depth. I made him, in order to give a colour to this apology, draw the rugine in a harmless way along the course of the fracture, saying in the time to the assistants, that it did not seem to me to penetrate, at least not deep. Thus the surgeon was acquitted, and the patient saved from a dangerous operation."

These accurate observers of the anatomy of the skull remarked, that a suture was smoother than a fissure; that a natural suture was serrated, while a fissure ran always in a straight line; that a suture was covered and closed with its periosteum, while a fissure was not so, but admitted the blood into the

chink so as to discolour it; and thence they fell upon the admirable invention of pouring ink upon the skull, which, by sinking into the slightest fissure, might discover it.

Who has the first honour of this invention is far beyond the reach of inquiry, for it is mentioned by Hippocrates *; but though he is the first that directs the use of the *nigra medicamenta*; though after writers, and Celsus especially, have had the ingenuity to substitute the *atramentum scriptorium*†, yet Guillemeau alone had the wisdom to remark the dismal consequences which might arise from such a pestilent infusion of galls and vitriol upon the brain, and earnestly insists upon the skull being rather daubed with *printers' ink*. But, as Celsus could not foresee that his books were to be *printed*, he is pardonable for using the ink he had; which by the by was not much different from printers' ink. Other inventions followed, still more ingenious; they had leaden hammers‡ for ringing the suspected cranium with, as you would try damaged crockery with the finger. “*Pulsu, dignoscere cautus, quid solidum crepet §.*” They gave the patient a cord or wire to hold betwixt his teeth, that when struck it might produce a jarring sensation in the fractured part; so

* “*His ita contingentibus, si non cognoscas aut os ruptura sit, aut contusum, aut ambo hæc, neque alias videas: super os aliquid maximi nigri coloris, nigro medicamento liquato subactum imponere oportet.*”

—HIPPOCRATES.

† “*At si tam quidem rima manifesta est, deinde id scalpro detrahendum, nigritiem enim si quid fissura est.*”—CELSUS, lib. viii. cap. iv. p. 373.—18.

‡ “*Item percutiatur caput cum levi baculo sicco, de salice aut de pino, et pone auram tuam apud caput; et si sanum est, tunc audies sonum sanum; si fractum aut scissum, audies sonum mutum.*”

—LANFRANC.

§ Persius.

anxious were they to discover a fracture, even when the patient was in his perfect senses, that they sometimes desired him to chew a key, or a bit of hard wood. These inventions need no comment; there is one thing, however, which may with propriety be added: “*Nonnulli præcipiunt,*” says Fabricius, “*ægro ut dentibus frangat amygdalam aut nucem avellanem.*” “Some direct that the patient crack almonds or walnuts with his grinders.” If the writers of surgical systems would but condescend to add this to their other methods, they would put the whole business in its true light.

Though I have seen many a painful and fruitless search for fissures, I confess I never have seen the cranium,—*virga percussa ut ederet sonum.* And though I have read much about this ringing of the cranium, I never had fallen upon any passage in which the author affirmed that he had heard such a sound, till I read the following in Forestus, whose learning, titles, and dignity, are a sufficient apology for what he may say upon such an occasion: “*A soni consideratione dignoscere possis, quia rauce sonat dum ejus caput percutitur cum virga: imo ego sæpius animadverti admota aure, vulneratam tanquam ex olla confracta locutum fuisse **.”

From the influence of all such surgical observations I hope I have delivered you, and from the theories of an age ill qualified to give lessons in our art, since they knew not how even to amputate a limb with safety. From the dreams and fictions of the closet, contrived by professors and physicians little conversant with our art, and handed down as important

* Foresti Obs. Chirurg. p. 97.

precepts to surgeons, at a time when surgeons were men of no estimation. These observations formed one entire and consistent system, of which a fondness for operation was the natural consequence, and it is my professed wish, and my duty, to impress this truth upon your minds, “That all the knowledge of ancient and of modern speculators derived from the anatomy of the skull cannot furnish forth one useful rule, since it relates merely to fractures of the cranium, not to injuries of the brain.” In plucking up, perhaps, too carefully this rank overgrowth, I hope and believe that I have sown the seeds of useful knowledge, and will trust to your forbearance and partiality not to be fatigued with the length of the narrative.

“Disce——cum veteres avias, tibi, de pulmone revello.”

DISCOURSE II.

OF THE PATHOLOGY OF THE INTEGUMENTS, SKULL, AND DURA MATER.

I BELIEVE I have proved to you, in my last discourse, that the study of the sutures, the diploe, the holes and processes, the thickness and thinness of the skull, begat a dangerous spirit of enterprise, taught the young surgeons to think of operations, of nothing but operations, and led naturally to a harsh and unrelenting practice; and you are now aware of this important truth, that the rules of our art are no

more to be deduced from the external forms of the skull, than the philosophy of the human intellect from the shape of the convolutions, cavities, and processes of the brain *.

That fractures of the skull, the most alarming and ugly fractures, are attended with less danger than the seeming slighter accidents, which lead to supuration of the brain, I shall prove to you at another time ; and I shall begin now to unfold the true theory of these injuries of the brain, by explaining, not the outward form of the skull, and the anatomy of its several bones, but the internal organization, the living powers, the susceptibility of injury, and the sympathy one with another of the pericranium, the skull, and dura mater :—these are the integuments of the brain, and from the slightest injury of the most remote of these, there often ensues, slowly, imperceptibly, and at a distant and unsuspected period, supuration of the brain itself. Life is endangered more frequently by a laceration of the integuments, or by mere contusion of the skull, or by an imperceptible separation of the dura mater, than by the widest fractures. Now, the proofs of this consist in facts, which even in their simple detail, though not connected by theory, nor recommended by any ingenious explanation, would be of themselves useful : but the mutual dependence of the scalp, the skull, and the dura mater, is so clearly made out by innumerable practical examples ; the progress of disease, from a slight puffy tumor of the scalp, to a fatal supuration of the dura mater, is so plainly traced ; the slow but undeviating progress of fatal

* [And yet how curiously, since the author wrote, has such a doctrine sprung up, to mark our time with disgrace.]

signs, from the first nausea, and slight tremblings of the hands and tongue, to the fatal convulsions, is so easily traced, and forms so interesting a subject for judicious prognostics, and sensible and manly practice, that I know not in the circle of our profession a piece of pathology more intelligible, nor a subject of inquiry more easily prosecuted, to sure and interesting conclusions. And we have this encouragement to consider the pathology in place of the anatomy of the skull, as the rule of our prognostics, that while anatomy, and the enumeration and classification of fractures, has led to an undue propensity to operation, the study of the living powers, and mutual dependence of these parts, leads to a reserved, modest, and rational practice,—to a just confidence in the powers of nature,—to a careful and solicitous attention to all the insidious symptoms of suppurating brain.

We have much reason to guard against deceptions so natural, so pardonable, as those which enter into the vulgar belief concerning the nature of bone. Bone is defined according to its obvious and useful properties; and these are, its strength, its hardness, and firmness, its capability of supporting the softer parts, to which it seems altogether dissimilar. A bone is laid upon the anatomist's table, dry and bare, and deprived of all its natural connexions, and he discourses only on its inanimate properties of strength and firmness; or on its holes and processes, and external forms; or on its relation to the softer parts, as affording them support, or protection; but never on its having one common nature with them. He even mistakes the most obvious circumstances of the structure of bone; seeing a cellular substance, full

of blood-vessels, pouring out blood profusely, when wounded in the living body, and destined, most obviously, like the cellular substance of soft parts, for the growth and perpetual nourishment of the bone, he describes it as a cavity full of cancelli, which are occupied merely with fat or oil, to lubricate the bone, and prevent its becoming fragile.

Bone is by nature so different from the other parts of the body, so perfectly firm, so colourless, and apparently insulated, that we forget to think of it as constituted like the other parts, as living by the same circulating blood, or as subject to the same diseases. Bone, though extremely vascular, has yet so little appearance of blood, that its circulation and living powers are demonstrable only by the most subtle injections, or to be inferred from particular facts. Bone lives by a system of vessels so peculiar to that form of animal matter, that when broken, lacerated, or any way thrown into unusual action, those vessels secrete only bone, which, in the case of wounds, or fractures, re-unites the broken parts; in case of necrosis (i. e. mortification), regenerates the bone; in case of disease, produces tumor; and all this seems so distinct from the secretions performed by vessels in all other parts of the body, and is a process so little dependent on surrounding flesh and membranes, that the vulgar must inevitably judge of bone as no other within the body, than that dead substance which they see and handle out of the body; in short, as a firm and peculiar concrete, destined to support the soft parts. The learned partake of this prejudice. The living powers and properties of this part of the system are not always present to our imagination, and it is only when called upon (as frequently we

are by accidents and the various consequences resulting from its disease), to recollect its organization, that we reason according to the analogy of the softer parts.

The skull is a living bone, defending the most important organ of the body, whose slightest injury, through the medium of its investing membrane, draws after it the most dismal consequences. When the scalp is bruised,—when the dura mater is violently separated by a shock,—when the skull itself is deadened by a heavy blow, so as to lose its circulation, and be no longer able to support its connexion with the surrounding parts,—a puffy tumor arises externally, while the brain is undergoing a slow ulceration within. The outward marks of injury seem trivial, the signs of internal danger are slight; yet there is no danger arising from injuries of the head so insidious, no cause of death so inevitable, as that which follows such a blow. Although the sympathy of these several teguments of the brain, of which we are prepared to regard the skull as by no means the most important, seems merely a subject of speculation hypothetical in its nature; yet does the inquiry lead to the surest prognostics, and to the most incontrovertible rules of practice; because the proofs of this sympathy are founded on the observation of causes, slow in their operation, obvious to every sense, terrible in their consequences, and ascertained by frequent dissections of those who die.

Till of late years, anatomists were utterly ignorant of the nature of bone. “A young Russian nobleman, of the name of Buterline, was, in a skirmish with the Tartars, wounded so cruelly, that a portion of the scalp, skull, and all was carried clean away by

the stroke of a sabre. The surgeon having killed a dog, cut out a portion of its skull, corresponding with that which in this nobleman had been cut off with the sabre, nitched it into the wound, and achieved a perfect cure. The nobleman exulting in this miraculous operation, told it to his friends, and his friends told it to the priests, and the priests told it to the Archbishop of Moscow, and the Archbishop of Moscow put him under the ban of the church, from which he was driven forth for having this fragment of a bestial body united with his, and banished from the assemblies of the faithful all over the Russian empire, so long as the said piece of dog's skull remained united, and joined into the head of a Christian man !

“ But this nobleman, longing to be received again into the bosom of the church, and willing to endure any pain rather than not be honestly and truly cured, spoke to the surgeon, desiring that he should take away this piece of dog's skull ; which being done, and his cure accomplished after another method, he was relieved from the sentence of excommunication.”

Not the jealous and drunken priests of Russia only, but the learned physicians of all countries, believed that a piece of dead bone might thus be united with the living skull, or rather with any other piece of bone which they knew not, nor even suspected to be alive.

Every surgeon was in old times in the practice of requiring a piece of gold, which he hammered and beat out into a form and size suiting the openings made by fracture, or the hole made by his trepan :—how far this may have been designed to deceive the vulgar, or persuade the friends ; how soon this

elemosynary piece of gold was transferred to the pocket of the dexterous operator*, we need not seek to know, since this is fairly implied, that among all ranks of men it was a received opinion, that a piece of bone, or a piece of gold, might be ingrafted upon the skull.

The most elaborate doctrines among the older writers concerning the office and uses of the dura mater do not bear the stamp of any more refined philosophy; they did not know the bone to be alive, far less did they imagine that the dura mater was destined to nourish the skull; they even did not know that it was connected with its internal surface; they believed that there was naturally an interstice betwixt the mediastinum and sternum, and that a like interstice was interposed betwixt the dura mater and skull. The dura mater, they imagined, belonged solely to the brain; they believed that the dura mater acted upon the brain like a glysonian capsule; that the contraction of the dura mater promoted the circulation within the brain, as was manifested in the alternate rising and falling of that membrane, when the brain was exposed by wounds or trepan. They imagined this space to be occupied by air only, and even made the bubbling out of that air through the chinks a proof of fracture:—"For if the patient," says Fabricius, "close firmly both nose and mouth, and press the air upwards, he will discover the air to

* "There are surgeons, no doubt," says Paræus, "or rather pretenders to surgery, who in such cases receive a piece of money, (which of course must be gold, as it is to be within the body), and in the presence of the patient beat it out to the form and size of the wound, and put it in there to defend the brain, and to be in place of bone, but they never fail next day to remove it into their purse."—Vide *Les Œuvres de Paree*, p. 241-2.

bubble out through the fissure ; for the inflation of the dura mater forces out the air or humour, which is inclosed in the space betwixt the skull and dura mater*.”

Each of these pathologists believed most potently all the uses that any other assigned for this cavity, and all the singularities which were described. Hil-danus, on account of the free perspiration through the sutures, and other good consequences of this open space, approves entirely of what nature has done :—
“ *Spatium vero inter suturas recte natura liberum reliquit,*” &c.† Thus it happens, that misrepresentation rises on misrepresentation by natural degrees, till the absurdity gets to a towering height ; though Fabricius believed merely that the rising of the dura mater drove the air naturally contained in this space before it, Ruinhuisen says a great deal more. He says, “ We may conveniently enough discharge the matter from the dura mater, when the patient comes to close his nose and mouth, and so drives the included wind from the breast to the head‡.” “ I do not well see,” says Morgagni, “ how we can deny that the brain may sometimes be more or less distant from the skull, even in the living body.” That the brains of children lie very high, even at the full moon, was the decided opinion of Turner ; wherefore he says, “ the operation of trepan is to be in them performed with every precaution.” All ancient authors ascribe much influence to the moon in disorders of the head ; and Fallopius, in an especial manner, believes that the brain is compressed :—“ That this

* *Fab. de Vulner. cap. 7. p. 858.*

† Page 18.

‡ Page 148.

space is augmented betwixt the skull and the brain, when the moon shines throughout the whole night." These neap-tides of the human intellect were carefully observed by all learned physicians; and surgeons were taught, according to the precept of Hudibras, how much safer and more officious it was to perform,—

“ The free trepanning of the skull,
As often as the moon’s at full.”

The influence of opinions, so remarkably ingenious and learned as these, is never slight; all the theories of injuries of the brain were more or less related to this supposed cavity. “ It was by being deposited in the empty space that occurs betwixt the skull and dura mater, that extravasated blood was supposed to inflame, corrupt, and be finally converted into pus*.” It was not difficult to account for the generation of matter, when blood was first extravasated, for the blood was corrupted by stagnation and heat, and by the new deposition of unconcocted serum. “ You will naturally inquire,” says Morgagni, “ why the blood, which was extravasated within the skull, gave no immediate tokens of its effusion, instead of beginning to do so many days after; without doubt, it is because very small drops, distilling very slowly from very small vessels, could not arrive, till after some days, to such a quantity as to be injurious to the brain.” Even the favourite doctrine of insensible perspiration suppressed by cold was called in to account for the corruption of the dura mater. “ This injury, by giving occasion (from the constriction of

* Arnold.

the external vessels) for a greater quantity of blood being carried through the internal parts, and that in a less salubrious condition, by reason of the insensible perspiration being detained! corrupts the dura mater*.” Such is the elaborate pathology of Morgagni.

It was still easier to account for the matter found under a fracture; they had this simple conception of such purulent effusion, viz. that it penetrated through the chinks of the fracture, and dropped inwards upon the brain†. When, upon perforating with the trepan, matter issued through the opening, they never doubted that it was the same which had dropped inwards through the fracture, and they estimated the danger according to the quantity of matter which might thus fall inwards upon the brain, or, in other words, according to the wideness of the fracture or fissure. “If only the outward table,” says Musitani, “be fractured, there is no manner of danger; but should both tables be fractured, there is the utmost danger, since the serum may there fall inwards upon the dura mater‡.” We cannot wonder, then, at the care with which they scraped every fissure, to see whether it penetrated, and trepanned every slight fracture, lest the sanies of the outward wound should fall upon the brain.

When there was no extravasated blood to corrupt, nor no open fracture to inundate the dura mater with matter, they bethought themselves, that all the body was transpirable, and why not the skull? “How to account,” says Valleriola, “for the sanies penetrating even into the brain, when there is neither fissure nor

* Morgagni, p. 89.

† Verdue, p. 212.

‡ Musitani, p. 155.

fracture of the skull, seems very hard ; yet we shall cease to wonder how this happens, if we but reflect that the whole body is perspirable*.” Sometimes “noxious matters were supposed to perspire from within through the cranial pores, to the infinite comfort of the cerebrum†.” The pus engendered within the cranium, and which endangered the brain, was, in a particular manner, supposed to transpire through those invisible pores ; and such was their persuasion of the importance of this transpiration of foul and fuliginous matters through the pores of the scalp, and the pores of the skull, that they believed a man could not a moment enjoy his intellect, nor live in health, without such a discharge. Nor did they disdain every care of the external integuments of the head, to keep the brain in good order, pure, and free from such fuliginous vapours‡. A blow upon the head, according to the apprehension of the older physiologists, neither killed the bone, nor injured the dura mater, but constipated the pores of the skull : “this is a full and perfect account of the whole affair,” says Magatus, “both according to experience, and according to reason ; according to reason, because the bone being bruised, its pores are constricted, perspiration suffocated, the natural heat extinguished, and, of course, ill humours generated from ill-concocted matter, which, rising in form of vapour, and finding no exit, inflames and corrupts the contused bone, even from the contused surface down to the dura mater, which being hereunto connected by various ligaments, those ligaments lead the

* Skenkious.

† Valleriola, p. 159. Folio.

‡ See Vitalis de Turnes.

corruption onwards from the bone to the dura mater, which is disordered and inflamed by the foul matter collected upon it, offensive both from its natural qualities, and the pestilent exhalations*.”

I am not ashamed to have detained you with a preliminary sketch, which will enlarge your conceptions, and extend your views, and make you less unwilling to part with the prejudices established by time and prescription, consecrated by high authorities, and intermixed with every part of learning. It may seem superfluous to remind even a tyro, that bone lives, grows, and is nourished; it may seem wicked and malicious to revive the memory of obsolete follies, only to make them the subject of wanton ridicule, while our own best knowledge is yet far below the level of truth, and is probably destined to become the sport of future theorists. But there are some follies which it is useful to know, and I am persuaded that this rude foreground which I have presented of rubbish and ruins, while it enriches the general sketch, will serve to make the distance clear and interesting.

To this kind of philosophy every fact is adverse; and it must be a matter of wonder, that men could practise our profession, and see bone occasionally subject to all the diseases of the soft parts, without being conscious of its life and circulation. The skull is a part of the living system, not less dependent on the general circulation, not less intimately connected with the surrounding parts, not less subject to disease and death, than the most delicate and vascular membranes of the body; and its slightest injuries draw

* Magatus, p. 188.

after them the most dismal consequences, for it defends the most important organ of the body. But, before we enter on the pathology of the skull, it cannot be superfluous to reflect for a moment on those conceptions of the structure of bone in general, which the inquiries of modern pathologists naturally suggest.

The form and structure of every bone is determined in the arrangement of its arteries, long before the bony-secretion begins ; and, in the course of years, the size and shape of the bone are accomplished by the gradual secretion of that animal earth which gives it strength and firmness. When we inject the bones of an infant, we perceive, by our senses, that they are vascular in a high degree, proportioned to that profuse and continual secretion for which this vascularity is destined. When we give madder along with its food to an adult animal, we find, from the manner in which all its bones are tinged, that this secretion is perpetual and incessant ; that the health of the bony system consists in the sound action of its vessels, and that the firm or earthy parts of the bones is continually secreted and absorbed. When, having injected an adult bone, we dissolve its earthy parts in nitric acid, and wash them away, we find that it has lost nothing of its vascularity, which seems, on the contrary, to have increased with its growth ; and, when a bone is fractured, we find that this vigorous secretion is ready to replace the lost, or to reunite the broken parts of the bone with callus, which callus is, from its recent secretion, more vascular than bone. Every disease, every operation, every dissection, proves to us, that this active circulation in the vessels of a bone is unceasing. In amputation, the surgeon

sees the bone, especially its cancelli, streaming with blood. In trepanning the skull, blood bubbles up through the hole long before he has reached the dura mater; and, when his saw tears up dust only, and that dry and bloodless, he is conscious that the bone is dead. A bone bruised is so far susceptible of ecchymosis, that extravasations of blood may be seen amongst its lamellæ. A bone cut up by the wound of a sabre may be reunited like any soft part. A bone laid naked, if it do not die, granulates, and adheres with the other parts. A bone, when so injured by blows, by fire, by caustics, by venereal, or other diseases, that it must die, grows black, just as the soft parts blacken by sphacelus, and separates with granulations sprouting from the neighbouring bone, as sphacelated parts separate from those which are still alive. The entire shaft of a bone, when thus diseased, and rejected as dead, is discharged slowly, and often in fragments, through the ulcers, while the surrounding membranes, and the still healthy heads of the bone, are producing a new shaft ready to supply the loss. Often from the surface of diseased ulcerating bones spring up soft fungi of very rapid growth; and, when a fracture is tormented with perpetual motion, or from impatience, ill health, or want of care, the parts are prevented from reuniting; or when, from a blow or bruise, a bone is thrown into diseased action, and its vessels kept in a state of continued excitement;—the bony secretion, having no limits, forms a tumor, solid as the bone from which it springs, usually cancellated, often having in it cavities filled with pus, and consisting of a secretion, partly cartilaginous, partly bony, and so massive, as

to load the part with its bulk, or not unfrequently to destroy it by its pressure.

The skull is highly vascular, has various sources of circulation and nourishment, and is peculiarly tenacious of life ; but all the phenomena connected with complicated structure are, by the usual methods of teaching anatomy, industriously removed from observation. The scalp is classed along with the common integuments, distinguished only as being peculiarly vascular. The skull is described along with the bones, each bone is separately described, and the forms, and processes, and holes of these bones, occupy so entirely our hours of study, that we form no conception of any thing but those forms. The dura mater, again, is described along with the brain, as its peculiar covering, and nothing observed but its connexions, and especially those processes by which it protects the cerebellum, or divides the hemispheres of the brain. It is by this anatomical method that every thing truly interesting is removed from our notice ; and the imagination or reason being allowed no share, we are taught to study anatomy as a task of the memory only, without one laudable or useful purpose.

The integuments, or scalp, *i. e.* the successive layers of the skin, occipito-frontalis muscle, cellular substance, and pericranium, are closely connected with each other, and with the skull, by one continued tissue of vessels. When these integuments are separated from the skull, even in the dissection of the dead body, the skull sweats out drops of blood from every point of its surface. The outer table of the skull is so plainly alive, that the surgeon can perfectly

judge of its death : when alive, it is moist, clear, and bleeds upon being perforated ; it is by its dryness and faded colour, and its bloodless appearance, and (when trepanned) by the dryness of the dust turned out in sawing, that the surgeon is able to pronounce it carious and dead. The skull is nourished, yet not altogether dependent for its circulation on its periosteum and scalp. A piece of scalp may not only be raised by a clean cut of the sabre, and laid down again so as to adhere to the bone, as to any soft part, but being cut off, it is replaced, in part, at least, by granulations from the skull. The integuments not cut, but lacerated, whirled off from the skull, flapped down over the face and ears, soiled with earth and mud, will, upon being cleaned, and laid in their place, adhere to the skull*.

The skull reunites thus easily with the integuments, from having every essential provision for life and circulation within itself. Anatomists studying merely the anatomy, have described the skull as composed of two tables, with intermediate cancelli, or net-work of bony fibres ; these cancelli are described as useful in the cylindric bones for enlarging their bulk, without augmenting their weight, or as cells fitted to contain the marrow which is to lubricate the bone ; and if ever these cells have been regarded as vascular, it is as having a vascularity appropriated to the secretion of marrow. The theorist, thus occupied in describing a bone, is reminded of nothing but its fragility, and the danger of its wanting oil. The practical surgeon,

[* Yet it must not be concealed, that there may be danger from laying down a flap on the skull, when either it or the bone is too much contused to adhere ; that is to say, the danger is latent, and time and opportunity are lost.]

on the contrary, when he sees the cancelli in amputations red as flesh, and streaming with blood, or when, in trepanning, he sees blood gushing up through the trepan hole, is conscious that this interposed cancellated structure is the centre of circulation and nourishment to the bone, and that the cellular substance which surrounds the soft parts to nourish them, must, in bone, be thus deposited in the centre, that it may be maintained in its form, and make a part of the common structure of the bone. It is from this arrangement, and from the perfect protection of its cellular substance, and circulating system of vessels, that bone is peculiarly tenacious of life. The thigh bone may be broken into fragments; many of these may be so displaced, as to seem separated from all natural connexion with the bone; yet the circulation of each piece survives; and, though the detached fragments are small, the bone shortened, and twisted into the most uncouth forms, each part lives, and is assimilated into the general mass of vascularity, by which the particular pieces are made to adhere, and callus is in the end secreted, so as to reunite them firmly. So is it with the skull, of which large and broad pieces are often apparently insulated by fractures, surrounding the piece of bone on all sides; and the surgeon, having performed the operation of trepan, passes his probe or finger into the hole, and is conscious that the dura mater is as completely detached from the internal, as the pericranium is, by laceration, or by scraping, from the external surface of the skull; and yet such insulated pieces circumscribed by lines of fracture, after being depressed by violence, are as violently raised by working with the levator; the surgeon believes that he should in duty

pull them away, and yet is fearful of doing harm ; they are left slightly connected with the skull, and very slight, if at all, with their own nutritious membranes, and yet they live, and are reunited, and granulate, and heal. Bone is universally, from the firmness of its structure, tenacious of life ; and the almost detached portions of a fractured tibia, and the rudely elevated fragments of a fractured skull, thus preserving their circulation, would almost persuade us, that a piece of bone, like a tooth destined for transplantation, might altogether be detached, washed in water, and recommitted to its place, so as to adhere.

[This passage requires some comment. One reason for applying the trephine, is the insulated state of a portion of bone ; for if a piece of the skull be cracked and broken off from the rest of the skull, if it be also separated from the dura mater below, and the pericranium on the outside, it cannot live, it must become a dead and irritating portion of bone, and cause suppuration on the membranes of the brain ; therefore it should be taken away when thus insulated.]

The circulation thus maintained by the pericranium from without, and maintained so vigorous in the structure of the bone itself, is well supported from within ; for, indeed, if we were to assign the nourishment of the skull to any one source, it would be to the dura mater, which is more properly the internal periosteum of the skull, than a membrane belonging to the brain ; with the brain it has no vascular connexion, but is separated by a halitus or secretion, similar to that of other cavities, as those of the pericardium or peritoneum ; with the skull it is

so connected, that great force is required to tear up the skull-cap in dissection, and every point of the membrane is covered with the ruptured mouths of bleeding vessels.

The dura mater is very firmly attached to the whole internal surface of the skull ; it is hard, firm, grates like a cartilage when cut with scissors, and has a glistening surface, like the capsule of a joint : it has no appearance of delicacy or sensibility, for indeed it has none, since acids, caustics, and even the actual cautery, have been applied to it, and it has been cut and torn in experiments on living animals, without exciting pain. It enters very slowly into diseased action, and has as little appearance of vascularity as of sensibility ; often it is inflamed, and even suppurated, without changing colour, and is little affected by our most subtle injections. But the injection, which does not change the colour of the dura mater, colours the bone, passes through its vessels, and runs out from innumerable minute orifices, when the dura mater is torn away. It appears from every circumstance, that the vascularity of the dura mater is destined for the nourishment of the skull, and may be truly named its internal periosteum ; and the arteries and veins of the dura mater might be justly described as the nutritious vessels of the skull. Were we first to observe this vascular connexion, and then glance our eye hastily over the facts relating to it, we should be apt to pronounce the skull entirely dependent for its nourishment on the dura mater ; and that its connexion cannot be dissolved by disease, without corruption of the bone, and suppuration of the brain, nor detached by violence, without effusion of blood.

Yet this important source of nourishment the skull may also dispense with, and live ; for, in cases of the most extensive effusions of blood under the skull, and where this membrane is divided from it by a thick and solid cake of coagulated blood, we find, that the skull bleeds in trepanning, and granulates during the cure ; and although it may seem a fact difficult to ascertain, I shall prove to your conviction, that the dura mater may, by a shock, be detached from the skull, and adhere again to it without harm, leaving unequivocal marks by which, in dissection, it can be known that it had been separated and reunited.

I take a pleasure in submitting to your review these facts, so opposite to the doctrines, and so inimical to the practice of the older surgeons ; for they will teach you, if you dwell upon them, to have a perfect confidence in the powers of nature. With so many sources of circulation, the life of the skull is very secure. The scalp, the skull, and the dura mater, are the successive integuments of the brain, they mutually support each other, so that they cannot be individually injured ; and we have reason to believe, that when the dura mater suppurates, and the brain is endangered, the whole system of this vascular connexion has suffered a fatal shock ; or the bone, the centre of that circulation, has been deadened by the blow. I fear that those general conclusions, which, by a sort of anticipation, I have laid before you, may seem more allied with speculation than practice, yet are they the true and genuine source of your prognostics. The establishing more authentically the conclusions which I have mentioned in a

general way, will convey the most useful lessons in surgery, and in medicine too; and I now willingly forsake these such general arrangements, to examine the special facts by which they are to be proved.

The several integuments of the brain, the scalp, the skull, and the dura mater, are not merely contiguous; they are not merely layers of integuments of various solidity, which may be dissected and described under various denominations of parts; they are essentially connected as a whole, having one continuous circulation, and having their disease in common.

[Here the author enters on a disquisition which I think now unnecessary. By cases and quotations he is showing, that in Chronic Hydrocephalus there is not a distension, but an actual growth of the skull, keeping pace with disorder of the brain.]

OF INJURIES OF THE SCALP.

Let us then turn from relations extraordinary, and almost incredible, insulated, as it were, by their magnitude, and therefore ill suited to form precedents, to facts of daily occurrence, and plainly useful, the examination and detail of which may ripen your judgment, and qualify you for practice. The most extensive lacerated wounds, and widest fractures, are less dangerous than the contusion of the skull; a truth which should awaken your attention to every doubtful appearance, and slighter sign of danger; and lacerations of the scalp very generally prove the doctrine which we have just laid down, that the

natural powers are sufficient for almost every exigency, and that it is easy, however extensive the separation, to re-establish the connexion of the scalp with the skull, if only there be health. The tyro in surgery must not only be convinced from hypothesis, but remember by the direct inference from facts, that the largest flaps of lacerated scalp are easily reunited with the remaining scalp, and with the bone.

The most extensive laceration, and the first I ever witnessed, was that of a servant, who, in riding a pair of wild horses to water, was unable to command them ; they turned furiously, and galloped under an arch ; he laid his head down by the neck of the horse he rode, but too late to escape the blow ; the sharp end of the stone, catching the scalp obliquely on the right side, cut it up with an incision as clean as that of a tomahawk, and whirled it back over the occiput and left ear, uncovering much of the right, and the whole of the left, parietal bone. In former times, extensive as this flap was, it would have been cut entirely away, to make room for dressing and exfoliating the naked skull. This man was not treated so coarsely, yet not judiciously ; his head was wrapped in a poultice ; when I saw it, the scalp was retracted, and curled up, and thickened, so that it never could be unfolded again, nor be made to cover the whole of the exposed bone. But, by careful treatment, it adhered to the parts below, the interstice betwixt the edges was filled with granulations, and healed ; but never did this man recover his health. From being full, florid, cheerful, and happy, he became poor, emaciated, hypochondriacal, and sickly ; he imagined every possible disease, and had indescribable sensations in the scalp, such as excited in my

mind the first apprehension of some permanent disease in the scalp itself, independent of any in the bone, or within the head *.

However extensive the laceration, if the skull be uninjured, the scalp not irrecoverably bruised, the patient in health, and not exposed to contagion or fever, it may (with only slight and partial interruptions) be made to adhere again to the bone. Of such recoveries, every practical surgeon has seen examples, and many interesting cases, made remarkable by the circumstances of the accident, are recorded. “A bricklayer, of about sixty years of age, walking incautiously along the ridge of a house two stories high, in order to lay some chimney-stones, in coming down again, he set his foot so insecurely upon the first round of the ladder, that he missed his footing, and rolled down the tiles into the street. He fell from the height of two stories, and his head lighted so exactly betwixt two great stones, that it was wedged fast betwixt them, without ever touching the ground, and the scalp, torn in the middle (in its whole length from the forehead to the occiput), was divided into two great flaps, which were whirled down over both ears. The man vomited the breakfast which he had just taken, lay convulsed in a very extraordinary manner, and was seized with a delirium which lasted four days, during which he struggled with such violence, that it was with great difficulty they got his hair cut and shaved, or the wound dressed.

[* I remember a man in very nearly similar circumstances ; when the large flap of integument adhered to the head, without having been stretched into its proper place, the consequence of which was that it lay wrinkled in deep furrows, and a large space of the bone was uncovered.]

“The whole scalp was inverted in a frightful manner, and almost the whole skull laid bare. The occipital bone, although that was the only place where there appeared no outward injury, was depressed. Monsieur La Motte, who was called to this man, washed his wound with spirits of wine, brought together the mangled scalp as well as he could, and, in opposition to the prejudices of all former times, and the universal practice of his own, covered the naked skull with its scalp, and stitched the flaps together with points of the interrupted suture, all but one corner, which hung down over the temple, so ragged and bruised, that its structure seemed ruined, unfit to bear the stitches of the needle, incapable of reunion, and sure to fall into suppuration, or rather gangrene. This he was forced to cut away, but the rest he brought so close, as to leave uncovered a space of four fingers-breadth only on the top of the head, near the meeting of the coronal and sagittal sutures.”

This wound, great and dangerous as it was, accompanied with depression, vomiting, delirium, convulsion, and every unfavourable sign, Mr. La Motte acknowledges that he might have cured in the end, and without delay, but for some taint of the scholastic learning of the times, and bad lessons learnt in the Hotel-Dieu ; for, when he saw the cranium bare, he could not refrain from assisting nature ; nature had formed these granulations which were destined to re-unite the bone and the scalp, but he would have a previous exfoliation of the bone ; and, while he was thus inclined to a regular exfoliation, and nature to a more simple and expeditious cure, the result could not be in favour of the patient.

“Every morning,” says La Motte, “I found this naked part of the cranium covered with fungous flesh, which, at each dressing, I scraped away in vain ; nor did even my desiccatives hinder its springing up from day to day, till I found myself obliged to abandon this design, and dress with simple lint, never imagining that this neglect could be followed by any kind of danger. But, after dressing thus for fifteen days, I found the exposed bones exfoliating. When the exfoliations began to project in the distant points through the flesh, I pulled them away successively.

“The cure I finally accomplished by five months careful dressing. During three of these months, the man was obliged to refrain from work. But he lived, after his cure, ten years, and worked at his trade to the day of his death. Lingered as his cure may appear, it was, nevertheless, abridged by the sewing of the scalp, without which I have every reason to believe it would have been protracted for a year*.” But I fear La Motte might have added, with equal truth, “Nay, it might have been accomplished in a few weeks, could I have prevailed with myself to renounce the old rules, and refrain from impertinencies which could not but hinder the natural progress of the cure, by occasioning that dangerous and slow exfoliation of the skull, which I am now persuaded was the work of my own proper hands, of my scraping irons, my desiccatives, my alum, lead, and white vitriol.”

The case, as it stands, is instructive ; and the wound and the cure were sufficiently remarkable to attract, in a provincial town (Valognes), the atten-

* La Motte, tom. 2. p. 278-9.

tion of the vulgar, high and low. The breakfast of porridge which the man had rejected, while he lay in a state of stupor, was mistaken for brain, and the flaps laid down over each ear made the mob imagine that his head was split like an apple. They believed in good faith that the skull was opened, and the brain discharged, and that the brain was baled back again by La Motte, with his two hands, into the empty skull, which he then closed up, and sewed firm with stitches. What they imagined they saw, they reported with confidence, and "in many a company of polite and sensible people, I was asked seriously," says La Motte, "whether it could be that I had put back the brain before sewing the head? which I answered according to the character of the inquirer, or humour of the moment, ay or no *."

La Motte, in all parts of his works, shows much good sense and observation; there is no innovation of which he seems more proud and confident than this of preserving and replacing the scalp, in opposition both to the prejudices of his times, and to the rules of the great hospital-surgeons, who seem to have been, from hurry or rudeness, the great corrupters of practice; indeed their slightest errors, multiplied by the imitation and improvements of numberless pupils, became serious and systematic faults of the profession. After reporting a case of lacerated scalp, in which a gentleman, having fallen on his own stairs, had his scalp torn down in the exact likeness of those incisions which we perform in dissection, when we design to saw the skull-cap†; and in which, not-

* La Motte, p. 282. tom. 2.

† "Je trouvai," says La Motte, "que le cuir chevelu étoit coupe de la même manière que lorsque l'on veut découvrir le crane d'un cadavre," &c.

withstanding the extent of the laceration, the looseness of the flap (which hung so low, that the garçon held it stretched in his hands till the hair was clipped and shaved), and its being engrained with sand, La Motte made a perfect and speedy cure by stitching it. He adds a specimen of a very different practice, for, having been called by a country-surgeon to assist him in the cure of one who had a similar wound of the scalp, uncovering the whole of the left parietal bone, he found that this surgeon, who had wrought long in the Hotel-Dieu at Paris, and seen Petit cut away every loose portion of scalp, imitated unrelentingly his celebrated master, and cut this flap so clean away, as to uncover the whole parietal bone, and protract a cure to six months, which might have been accomplished by a better method in as many days *.

Such has been the practice of Sharp, of Pott, of Dease, and of many hospital-surgeons; and it will not be unfavourable to your recollection of this plain and useful lesson, that it is connected with such a man as La Motte, and with the surgery of the last age. The recollections of his own faults seem to bear hard upon La Motte; he is not so disingenuous or ungenerous as to disclose thus the faults of others, concealing his own. He relates, in contrast with his better method, learnt from experience and observation, his ill practices, when he first went out from the Hotel-Dieu. His first patient had been a young girl, with a simple wound in the forehead, whose cure he had protracted, and whose forehead he had deformed with an unsightly scar, by seeking to procure a regular exfoliation of the bone. "Woe be

* La Motte, p. 457-8. tom. 2.

to those," says La Motte, "who serve as subjects of his first experiments to the young surgeon; such was the ill-fortune of my first patient, for, being just come from the Hotel-Dieu, where I imagined I had learned every thing, I began by dilating the wound with tents, hard and firm as I could make them, with the design of keeping the bone open, till it should cast off its scale, fearing the worst consequences, should I suffer the bone to be covered*." How unsparingly and unrelentingly he proceeded in this work of exfoliating the bone, he next represents to us in apostrophising the girl, in the true Gallic style. But this reformation in his practice, which had enabled him to save others from the like deformity and pain, seems to have given him real pleasure, as a man proud and zealous in his profession.

There is another maxim I would impress upon your minds, that the surgeon must not presume to decide, *à priori*, what parts of the lacerated integuments may be reunited, and what parts are unfit to be sewed, for that is a problem which never can be resolved but by the issue of the case. A piece of scalp, though irrecoverably bruised, cannot (though replaced, as if with hopes of its adhering) do the smallest harm to the skull; and we have innumerable proofs, that teguments, much lacerated, may retain their life and circulation, and that, although foul with soil and sand ingrained into them; so that even in such cases we need not scruple to put the usual stitches into the wound, as I did," says Paræus, "in the case of a soldier wounded at the Castle of Hedin, a little before the last siege. This soldier was em-

* La Motte, tom. 2. p. 445-6.

ployed, with many others, in digging earth to carry to the ramparts. The earth falling in upon one party of them, many were suffocated and crushed to death, while this soldier was dragged out from among the rubbish alive, with his scalp bruised and lacerated, and torn down from beyond the top of his head, and hanging so over his face, as to strike his companions with horror. When I saw him, I called Charles Lambert, surgeon to the deceased Duke de Bouillon, to assist me. I washed the wound in warm wine, both to cleanse it of the coagulated blood, and wash away the earth; then it was well wiped and dried with a linen cloth. There was applied over the whole wound spirits of turpentine, with an admixture of spirits of wine, in which sanguis draconis, mastich, and aloes were dissolved; then the flap being replaced, was secured with several stitches of the needle, (not firmly drawn, for fear of inflammation and pain, which is most apt to occur at the time of the first serous effusion), to unite the parts, and save them from the contact of the air." Some of the other precautions of Paræus were less consistent with sound principles, or modern practice; for he put into each edge of the lower part of the wound long tents, to preserve a free discharge of the matter, which could not but tend to inflame the wound; and it is not easy to conceive how the upper end of a wound like this should adhere, while its lower part was thus tortured into a state of suppuration; besides, there was laid over the whole head a poultice of bean and barley meal, mixed up with vinegar, while it should have been kept clean and dry. "I advised him," says Parée, "to retreat to Abbeville, as the enemy was prepared to besiege us; and you may be assured,

that after having been exchanged from my imprisonment (for I fell into the hands of the enemy), I saw this soldier in Abbeville in perfect health."

The circumstances of a case related by Mr. Hill are so particular, that you will naturally take an interest in it. While the older surgeons cut away every portion of scalp, however slightly or partially detached, our practice is to replace confidently every lacerated scalp, however much insulated, mangled, or polluted with soil or sand. The case related by Mr. Hill will leave always upon your minds a lively recollection of the fact.

"A drunk countryman, aged sixty-six years, riding furiously along the street, was flung with such force against the sharp edge of a door-post, that about the length and breadth of a hand was stripped off the right side of his head, and laid down on the cheek.

"Some people, in the dark, took his wig out of the kennel, and, not knowing what had happened to his head, put it on full of mud, and squeezed his hat over it. He did not complain of his head, but complained greatly of his neck and shoulders.

"The dirt was rubbed into the *Tunica Cellulosa* in such a manner, that it was impossible to clean it fully out. I therefore pulled up the loose piece of the scalp, and, after washing and stuffing it with soft liniments, put four stitches into the upper part, but so loosely, as to allow the matter a free passage.

"The wound digested so well, that in five days all dangerous symptoms were over, and his friends carried him home without acquainting me. Having no proper person to take care of him, the stitches gave way one after another, and it healed, leaving near two fingers-breadth of the skull bare, the teguments

lying in folds on the *Os Petrosum*. This circumstance might easily have been prevented by renewing the stitches. He, however, lived and enjoyed good health above twenty years."

Yet a laceration of the scalp is a state of danger and uncertainty. We never can be assured that the bone is not too much injured to admit of its reuniting with the scalp, or that the constitution is not too weakly, or the season or the air unfavourable; we never can be assured, even when the prospect at first is most flattering, that a laceration of the scalp will not be followed by a suppuration of the brain.

"Thomas Sharpe was an itinerant dancing-master, a fiddler, a performer in a military band; he died trumpeter to the Dumfrieshire militia, and had attained to all the perfection of libertinism, and dissolute behaviour, that such occupations naturally entail upon their professors. One morning, reeling out of a low tavern, he, after scrambling up the stairs of it, staggered forwards into the unguarded area of a house that was building, and, without any other apparent injury, had his scalp torn down over his face. The scalp was ragged in its edges, and mangled every where, with several penetrating wounds; it was separated from the whole upper part of the head, from the lambdoid suture, nearly to the eyebrow, and from the vertex to the right ear; much of the skull, and especially of the *os frontis* of that side of the head, was laid bare; nor was the opposite side without bruises, and lesser wounds, for it seemed to have been jammed in among the loose stones.

"The scalp was sponged, cleaned, and dried, and smoothly applied again to the skull; and as the edges of the laceration were irregular, and bruised, and in

DESCRIPTION OF PLATE Page 464.—Vol. II.

HEAD OF THOMAS SHARPE :

Fig. 1. Sketch of the Scalp partially reunited.—A large Abscess above the Ear discharging a profusion of Matter.—*bb* Extent of carious Bone and dead Scalp.—The Probe passing from the Opening *c* and *d* out by the Opening *e*, and all round from the Vertex to the Temple and Ear, betwixt the Scalp and the Bone.

Fig. 2. The Integuments laid back, and the Ex-

tent of carious Bone exposed.—*ff* Marking the Extent of the Caries.

Fig. 3. Drawing of the Scull-cap sawed off and preserved.—*g* Marking the Centre of the Caries.—And *hh* The deep ulcerated Furrow in the Bone by which the carious Part was circumscribed, and which might have been mistaken for a deep Fracture.



Engraved by E. Mitchell Esq.

Drawn by J. Bell.

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no fit condition to be nicely joined with stitches, they were held by plasters only, they were united in a few days with each other, and even seemed reunited on the lower surface with the surface of the skull; whatever inflammation there was, seemed a very natural consequence of the general bruises, and lesser wounds of the scalp; and we were confirmed in this good expectation, from the man's having recovered from his intoxication, and continuing in apparent health. He felt his bruises, and complained of the pain, slept well, had neither delirium, sickness, nor fever, and was bled only on account of the fulness of the pulse.

“On the fifth day, the little discharge which issued from the irregular openings, and smaller wounds, was good; the adhesion continued apparently sound; on the sixth, the discharge from under the scalp was more copious, and compresses were nicely applied to keep the scalp and the skull in contact with each other. On the eleventh day it became necessary, from fluctuation and softness in all the lower part of the detached scalp, to make an opening over the ear for the discharge of matter, which flowed so profusely, and was accompanied with such fits of rigour, that I abandoned all hopes of any firm or general re-union, and began to fear that the brain was in a state of supuration. Upon pushing the probe through the soft and downy granulations which united the edges of the scalp with the skull, I was persuaded, that all below the mere edge was disengaged, that the whole extent of the parietal bone was rough and naked. The probe, in its progress between the skull and integuments, encountered what all my assistants conceived to be a fracture of the skull; yet still the

patient retained his senses, and suffered little in his health.

“ The symptoms of suppurated brain are, as I know from much experience, far from alarming when they first appear. The detached state of the scalp, the roughness of the bone, the profusion of matter which flowed through all the openings, and the slight rigors, dejected looks, and tremblings of the hand and tongue, though they are such as alarm the surgeon, can hardly vindicate him in taking any decisive step. I was persuaded that the bone was dead, and the brain in a state of suppuration. I saw no prospect of interposing with success at so late a period as the sixteenth day from the injury. I was supported by the consulting surgeons in the preliminary step of opening the scalp, and exposing the diseased bone ; but they seemed to suffer a disappointment, when that rough line, which was so curiously traced with the probe, was found not to be a fracture, and, as there was no fracture, I was, fortunately for my reputation, prevented from applying the trepan ; for though there was every motive for operating, the patient died next day of a disease, inevitably fatal, connected indeed with the accident, but having no relation to the state of the brain.

“ Let me now, then, proceed to give you an account of the condition of this man before the operation, of the manner of his death, and of the appearance on dissecting the body. Before the operation of cutting up the scalp, there were no decisive signs, nor fatal prognostic ; for of all the fatal affections of the brain, this of suppuration of the dura mater is the most insidious in its progress ; and our patient,

before we apprehend him to be in danger, is in general beyond the reach of help. This man, though he had the cranium naked, the scalp in full suppuration, and a profusion of thin matter pouring out from various openings, had no other symptoms than slight rigors, and no more violent rigors, indeed, than often accompany the slight fever of a lacerated scalp. It was towards the sixteenth day, perhaps about the fourteenth, that these rigors were followed with a sweating stage, that they became sensibly more frequent and violent, and that they were accompanied during the day with unusual languor, and in the night with a slight delirium, which only disappeared when he was thoroughly roused from sleep. Yet, at this most critical period, I could not make him say that he had any corded feeling over the brow, any headache, any thing which might indicate to his own apprehension a disorder within. I could not perceive the slightest wavering in his intellect; I could not find, in the irritable state of his pulse, the foulness of his tongue, the dulness of his eye, in his perturbed sleep, and alarming dreams, any thing more than the feverish disorder naturally accompanying so extensive a laceration of the scalp; and yet at that moment was the suppuration of the dura mater fairly established, and the brain itself deeply tainted.

“ An increased drowsiness, with rigors more violent than usual, a degree of headache, and a sensibility to light, induced us, upon the sixteenth day, to cut up the slight adhesion of this great flap of suppurated scalp, which immediately fell over the ear, and left the whole parietal bone exposed, in a condition perfectly decisive, in my opinion, of the state of the brain, and indeed of the patient's fate.

There was a portion of the parietal bone broad as the palm of my hand, of a square form, apparently insulated from the rest, black, carious, and elevated above the level of the surrounding bone, and circumscribed by a line as decisive as if it were a fracture. This part, which was the centre of the parietal bone, was rough, dry, and prominent, of a dark yellow colour, engrained with black spots like a toad's back. The pores of the bone, or, in other terms, the minute and almost invisible holes by which the blood-vessels enter it, seemed wide, and not red as when blood is circulating, but black. In the margin immediately surrounding this, where the bone was still alive, and in a state of ulceration, the bone was wasted, so that the carious part was left prominent, with a line so fairly circumscribed, that, when felt with the probe, it might be mistaken for fracture; this is indeed uniformly the condition of a dead and exfoliating piece of the skull. Beyond this ulcerating circle, where the integuments and muscles adhered, they adhered with particular firmness, being crammed with extravasated blood, and hardened by inflammation. Though the certainty of the brain being in a state of suppuration inclined me to perforate the cranium, the certainty now of there being no fracture inclined my assistants, and the consulting surgeons, to refuse their consent to that operation, which alone could save our patient; thus I was destined to escape the opprobrium of having shortened the life of a man, whose death, from a very different cause, was inevitable.

“He was perfectly sensible during this preliminary operation, and would most willingly have consented to any measure we might judge expedient. But,

when he was conveyed to bed, he seemed weak, his breathing was low and difficult, his pulse, which had beat 124 in the afternoon, was this evening extremely feeble and slow, and he broke out into a very profuse sweat. His features were shrunk, and his face pale and ghastly. About four in the morning he was seized with sickness, and severe vomiting, and with a rigor, which lasted fully twenty minutes, and at eleven in the morning his breathing was extremely oppressed; it was painful to witness his struggles for breath, and the anxiety and cold sweats which it brought upon him: in half an hour after his most violent struggle for breath, he was seized with a profuse hæmorrhage from the lungs; brought up, with coughing and struggling, fully a pound of florid blood, and expired. Thus, in the very moment in which he came into manifest danger from suppuration of the brain, he died from the bursting of a blood-vessel in the lungs. What bruises, besides the wounds of the head, he may have received unconsciously in his state of intoxication, we do not know; but nothing is more likely, than that in the fall which thus hurt his head, the lungs had also suffered material injury; it is perhaps from such injuries passing unnoticed that suppuration of the liver so unfrequently accompanies fractures of the skull; indeed, I know not how a man can fall from a height, without so heavy a viscus as the liver suffering by the shock, independent of any direct blow.

“The appearances on dissection were as follow: The appearance of the brain implies danger; but it was the dissection of the lungs that explained his sudden death. Upon raising the cranium, all that surface of the dura mater which lay under the dis-

eased bone was in full suppuration, covered with white and mature matter, and, in many points, perforated with ulceration. The pia mater, in contact with the diseased dura mater, was not yet ulcerated, for the brain cut sound and firm up to the very surface; yet the whole mass of the brain was in some degree affected, an increased action of its vessels had unquestionably taken place, for all the ventricles were enlarged, and full of serum, but not obviously inflamed. Thus our patient was in that state of danger from suppuration of the brain, from which so few are recovered even by the most timely operations; but the sudden bursting of a great vessel in the lungs was the immediate cause of the death; for, upon opening the right side of the thorax, there was found in the lungs of the right side a great effusion of blood, and a small superficial ulcer on the largest lobe of this part of the lungs.

Whether is it to the mere laceration of the scalp that we are to refer all this disorder? Was the scalp so mangled by the sharp and irregular stones among which this man had fallen; was it perforated in so many places by these irregular wounds I have mentioned, as to destroy its texture, and make it no longer capable of maintaining its connexion with the skull? Or, was the bone itself so much injured in its internal structure and circulation as to be incapable of pushing out granulations to meet those of the scalp? Does not the practice here pursued, of holding the scalp in its place, of supporting partial adhesions, and endeavouring to extend them by using compresses, and confining the inflamed scalp in contact with the diseased bone, tend rather to increase that inflammation, and indeed to widen the separa-

tion? Were not those symptoms of shiverings and languor which (slight though they be) indicate suppuration of the brain, too long neglected? Should I not, in place of making successive openings, when new abscesses were generated, have thrown down the scalp to examine the bone? Should I not, according to the strict rules of good sense and good surgery, have proceeded to trepan a skull, carious to such extent, unequivocally dead, quite incapable of maintaining any connexion with the dura mater, sure, on the contrary, to operate upon it as a foreign body, and to produce suppuration? For this was not one of those circumscribed and superficial exfoliations, which can be thrown off without danger to the brain. Finally, since this patient survived so horrible an injury for three weeks, and died by a sort of accident, is not the long delay of this fatal suppuration a sort of proof, that it happened not from primary separation of the dura mater detached by the shock, nor by a secondary separation depending on slow disease of the bone, but from this destruction of the scalp, followed in succession by death of the skull, and suppuration of the dura mater, the internal periosteum of the skull?

Though I regard every fatal cause as an occasion of reflection, and almost of self-reproach, yet I am sensible that this case was too complex not to admit of many apologies. There are in such cases of lacerated scalp certain irregularities and anomalies which incline me at all times to proceed with caution. There are conditions of the individual systems, and varieties of climate, or air, which, without any local cause, without the scalp or the skull being essentially ruined in their texture, prevent their re-union, and

even occasion death. The air of particular countries has been remarked through ages as peculiarly noxious to those wounded in the head. Lusitani has celebrated “the noxious air of Florence and Bologna, while the air of Ragusa, seated upon a rock, is so extremely favourable, that even where the cranial bones are fractured and destroyed, hardly any patient dies, but all recover*.”

In Africa, the climate was so severe upon the French army in their celebrated expedition under Charles V., the days were so hot, and the nights so moist and cold, that they were in the greatest danger of being all cut off by fluxes, fevers, and ill-conditioned wounds. “Wounds in the head were very perilous in that place, so that if a hundred were hurt in the head, it was not possible to save ten; for the day was so hot that it burned all things, and the night was so extremely cold, that it was intolerable, and not to be endured, and so by this distemperance, when the cranium was uncovered, that the air might touch it, presently they died without any help. Then I seeing that, began to consider of the matter, desiring to find some means to help them, and so studying, it came into my memory, that the air was the cause of their death, as it was in truth. Then presently I commanded all the surgeons that were under my jurisdiction, that they should not meddle with any wound in the head without my presence, which thing was done; and as many as were wounded, the first thing I did, instead of cutting or lancing, or discovering, according to the common order, I

* Florentiæ et Boroniæ ita capitis vulnera periculosa sunt, ut raro capite vulneratus sanatur, &c.—LUSITANI, cur. 100. c. 6.

joined the parts ! and sewed them close ! and dressed them upon the wound with our quintessence, and with balsams, and with magno liquore, and in a short time the most part were helped, and there died none so desperate as before, and, therefore, (says Phioravanti, the author of this encomium upon his own practice), in my judgment this was a good invention *.” Nor will any modern reader dispute that it was, since, in place of the scholastic methods of incarning, exfoliating, and cicatrizing, Phioravanti replaced the scalp, sewed the wound, and dressed it close with that admirable balsam, to the virtues of which he so proudly ascribes his success.

The air of a country changes from time to time, “ so that now,” says Donatus, “ in our town of Mantua, four or five years have passed in which the air has been so malignant, that the slightest injury of the head has been fatal ; but from the third year this tendency of the air (*influxus cœli*) began to decline, so that now such wounds are without danger, and no one dies†.”

The ill air of an hospital is more fatal to the reunion of the scalp than either the bruising of the scalp, or the injury or contusion of the bone. The air of the hospital, the Hôtel-Dieu, in Paris, is more noxious than the climate of Cremona, Florence, or Mantua, and has been a matter of regret in all ages. The good old surgeon Saviard shows us what danger there is in making even the slightest incisions, by a case instructive in many respects.

“ Nurse Bernard of the Hotel-Dieu, no more than

* This is the Phioravanti whose history and practices are mentioned in the First Volume.

† M. Donatus de Variolis, cap. ii.

twenty-three years of age, was struck on the back of the head by the falling of a poll, set up for drying clothes, and fell senseless to the ground. Upon giving her a little *eau de vie*, she revived, when there was observed upon the injured part a small bump only, of the size of a nut, and without any wound.

“The same evening she vomited, and was oppressed at intervals with a degree of stupor, which having continued during four days, we became anxious,” says Saviard, “and resolved to open the tumor, which was full of coagulated blood, the pericranium adhering soundly to the skull beneath. From this time forward she had irregular shiverings, which lasted, at each return, four hours uninterruptedly; and during the seventeen days in which they continued, we reckoned twenty-five returns. Bleeding we were so little sparing of, that in the first days of her illness we bled her no less than fourteen times in the arm, and once in the ancle; her vomiting continuing incessantly, accompanied with pungent pain in the region of the liver.

“After the seventeenth day, gangrene came upon the wound, which forced us to make repeated incisions; bad symptoms continued, notwithstanding, for forty days, and two months and a fortnight had expired before the wound closed. Nor did her sickness end here, for shortly after the closing of the wound, her face was puffed up with an œdematous swelling, much serum running continually by the ears and nostrils for fifteen days; deafness supervened, with lancing pains, and continued disorder of the head; more than a pint of reddish matter flowed from the nose, and a rheum inundated the chest, and threat-

ened suffocation to such a degree, that for a long while we looked for nothing but sudden death. It were impossible to enumerate (besides the twenty-six bleedings) the various medicines she used; it was by the frequent use of ass's milk that her health was at last restored. Her pains in the head continued for two years, with beating of the temples, which increased with every change of the weather.

“None but those,” says Saviard*, “who have experienced the malignant influence of the Hôtel-Dieu of Paris (incontestably the most crowded hospital in Europe), can imagine the ill effects it has upon the constitutions of wounded patients, causing even the slightest wounds to become mortal. Those who have never served in this hospital will no doubt wonder that a slight contusion like this, in which the bone was in no degree laid bare, should be followed by such a train of symptoms, while those who have will be little surprised with a scene they have witnessed continually.”

This hospital, mentioned in all periods as a most foul and pestilential congregation of vapours, is now reformed; Saviard, the oldest surgeon of this hospital, whose works are come down to us, thus warns those who may succeed him in his office. Paré, still

* Ceux qui n'ont pas l'expérience des impressions fâcheuses qu'un aussi mauvais air que celui de l'Hôtel-Dieu de Paris, qui est sans contredit l'endroit de l'Europe, où il y a en tout temps un plus grand nombre des malades, peut faire sur le corps des blessés pour rendre les moindres blessures mortelles, seront sans doute surpris, qu'un simple contusion à la tête, en laquelle l'os du crâne n'a jamais été découvert, ait été suivie d'un si longue suite d'accidens; au lieu que tous ceux qui travaillent dans cet hôpital n'en sont point étonnés, étant sans cesse les témoins des effets funestes de cet air pernicieux, et trop souvent même du nombre des victimes exposées à ses insultes à leur propre dépens, &c.

more impressed with the same danger, and struck with the ill success of those operations, proposed that an hospital should be erected in the suburbs, in a more healthy air, for the reception of those wounded in the head. La Motte speaks with compunction and penitence of the bad lessons he had learnt in the Hôtel-Dieu, and of the ill success proceeding from the malignant air. Petit complained of the mortality in his time; and Dessault, the last surgeon of that hospital, found himself so unsuccessful, that he renounced at last all thoughts of operating in fractures of the skull, and, with a few ordinary precautions and remedies, abandoned every such case to nature.

Without having the misfortune to have served in any hospital, where, to use the language of Saviard, “I saw innumerable victims;” or, being driven to absolute despair, like Dessault, and abandoning all hopes of being useful in wounds of the head; I have yet learnt a degree of caution, with which I would fain impress you in your first conceptions; for of all the abuses of practice, the most grievous to one who reflects soberly and modestly on what art can do, is the confident and presumptuous hope which young men are too apt to indulge, of reuniting every piece of lacerated scalp by the main force of sutures, and relieving every symptom of oppression, or slight delirium, or temporary fever, by trepanning the skull. I have often observed, that though the season seemed favourable, the heat moderate, and the air of an hospital untainted; while other patients, and less important wounds, were recovering apace, and no sign of infection could be perceived; those wounded in the scalp became, after a few days confinement, languid, feverish, and oppressed, and had every usual

symptom of an oppressed brain. Not to specify innumerable cases, from which my general observation is deduced, I have seen a boy whose scalp was lacerated so very largely, as to show the skull naked, but uninjured, continue well, and free from fever or delirium several days, then seized with vomiting, like that of oppressed brain, with rigors and foul tongue, and rapid pulse, and delirium. I have seen a boy lying in this doubtful and dangerous state for fifteen days, the suppuration of the wound being interrupted, and its complexion as much affected as the general health; exhausted by successive paroxysms of fever, and yet in no imminent danger. I have seen three soldiers hurt, in the confusion of a fire, from bricks or beams falling on them, all the three wounded in the head, all seized at once with the same temporary fever and delirium, and yet not one of them in any kind of danger. I have often seen, in an aged person, where the skull was laid bare by a blow, the integuments slough entirely away, and fall off in cakes as black (to use the expression of nurses) as the soot on the pot, and after an interval of imminent danger, in which even the outer plate of the skull has exfoliated, I have seen, with admiration, the skull push forth its granulations with such vigour in extreme old age (at seventy-five years of age), as to replace the scalp with a broad and firm cicatrix. These accidents of fractured skull, or lacerated scalp, are frequent only in an hospital; and you will often observe your patient, whatever his age or constitution, attacked with sickness and fever, which seems to imply danger, but which is to be cured by antimonials, opiates, and the warm bath. You will have the goodness, then, to believe, that this is no insignificant

vindication of my own conduct in an unfortunate case, but an independent, a necessary, and a useful injunction to you. “ Never permit yourselves to be alarmed too much at these first symptoms of fever, nor hurried into any precipitate step, for many have narrowly escaped the knife and the saw, the scalping process, and the useless perforation of the skull, to whom, during the continuance of such a temporary fever, the slightest of these operations would surely prove fatal.

I think it of so much importance to the young surgeon to have these prudent maxims thoroughly established in his mind, that I would rather err on the safer side, and shall transcribe one case from my books. The slow progress of the symptoms of suppurated brain has always struck me as peculiarly interesting, and the critical situation of the boy Tom Scott, which I am now to describe, attracted my attention. “ This was a fine boy of thirteen years of age, who having, on New-year’s day, got into an empty hamper which was in a cart, the horse running off, the hamper was canted out of the cart, and the boy tossed like a cat out of a basket. His fall was, of course, from a considerable height, and his head lighted among broken bottles. A woman came out, took him in her arms, and carried him up stairs; washed his clotted hair, and took a very motherly care of him, till Mr. Cheyne, junior, of Leith, came, and sewed a considerable wound of the scalp.

“ But from this time he was sadly neglected, being sent to the hospital, where I saw him first on the twentieth day. On the eighth day, probably on account of ulceration of the scalp, the stitches had been cut out, and the wound thrown open; the cut,

arching in a semicircular form over the parietal bone, was in a state of ulceration. The bone was bare in its upper part, and rough, and apparently carious to a great extent. Where the bone seemed soundest, it was covered with that fine down of granulations which springs from the surface of a denuded bone, and which is easily pushed off with the probe. The edges of the wound of the integuments were bordered with the same flat and glossy granulation. The scalp from the place of the cut (which passed in an arched form over the top of the head) was quite down to the ear, in a state of complete suppuration. The fluctuation of matter was every where manifest; the scalp, in many places, as thin as parchment; the redness of internal ulceration, threatening to burst outwardly, was remarkable in many places. The greatest bag of suppuration was immediately around the ear, and an opening was made with a bleeding lancet just before the ear, by the side of the temporal artery, from which a profusion of pus was discharged; a second opening behind the ear was also necessary.

“ With such an extent of suppurating scalp and carious bone, the boy's condition seemed of itself extremely critical. But the fever and sickness had risen, at the same time, to an unusual height; I found him, on the twenty-first, after these very necessary openings, with a furred tongue, a rapid pulse, beating more than 120 in the minute; his skin parched, his thirst very great; the face not flushed, but the eye heavy and oppressed, and the pupil (though in this I may have been mistaken, as he had a very large black eye), somewhat dilated; his motions were peculiarly languid, and he laid his

head, during the dressing, very oppressed like, on his nurse's shoulder. During the night he seemed slightly delirious, and at one time screamed out very violently, having taken a great alarm at the noise of coals being brought into the room. When slumbering, he mutters ; when first roused, he talks incoherently ; when held up for dressing, and especially when tormented by the probings and incisions, his feelings and senses are acute, and his remonstrances and entreaties very sensible.

“ His situation was, in every respect, critical and interesting. It is not difficult for one who has been attentive to practice, to distinguish the oppression and languor of fever from the stupor and nervous affections of an ulcerating brain. I saw something in this boy's condition which inclined me to treat his illness as a symptomatic fever, and I hold this case to be no bad illustration of the remarkable aphorism above quoted, and of the application of it to injuries of the head ; for stupor accompanied with fever is void of danger ; a slighter sickness and oppression, with more of nervous feelings, would have been to me much more alarming.

“ I treated this as a symptomatic fever, with antimonials, opiates, fomentations ; pressed out the matter gently ; dressed the head lightly and carefully ; the integuments subsided, and adhered ; the bone granulated, and united with the edges of the wound. The various lesser abscesses were consolidated, and I had the pleasure to find that I had calculated rightly ; that this boy was ill only of the symptomatic fever of ulcerated scalp, and was, by prudent measures, saved from the knife and the saw. But, had a consultation

been called, he would have been trepanned ; had he been trepanned, he must have perished. But more of this in a future discourse.

That aphorism of Hippocrates which relates to the fever of intoxication, may be transferred, without reserve, to that accompanying wounds of the head. “ If a man be so intoxicated as to lie speechless, and he be seized with fever, he is in no danger ; but if not seized with fever, he dies the third day*.” We may, with much greater truth, pronounce the patient safe, who, having a wound of the head, has his delirium and vomiting explained by concomitant fever ; while he who has slight shiverings, a less perceptible oppression, and no concomitant fever, is in a doubtful state.

Two inferences, I believe, are now plainly established. First, That the scalp, though lacerated and ingrained with soil or sand, will reunite, in favourable circumstances, with the skull, as with any soft part. Secondly, That the circulation from the pericranium to the skull is so essential to its sound and healthy condition, that often its violent separation affects the whole circulating system of the bone, occasions its death, and endangers the brain.

That the mere separation of the pericranium will effectually destroy the skull, is but too well proved by the practices of the older surgeons†.

When, at any time, I have seen large portions of the cranium carious, and separating without injury to the brain, I have inferred that the skull was killed,

* “ Si quis, ex ebrietate, voce privetur, et statim sane ipsum etiam febris corripiat sanus sit ; si vero non corripuerit die tertia moritur.”—Hippocrates.

† Arcæus de Curand. Vuln. lib. 2.

merely from being deprived of its pericranium ; when an old and drunken creature, for example, has fallen into the fire in a fit of intoxication, and the integuments have sloughed, and the parietal bone exfoliated, of which I have seen repeated examples, the fact is plainly proved ; but when, as in the following, the caries proceeds from a blow, we must remain in doubt whether such blow had merely injured the integuments, or affected the bone.

“ A woman about forty-five years of age, whose convivial talents I was not at first aware of, came under my particular care, with a large wound on the side of the head, about which she told an incredible tale, saying she had been robbed, though she was penniless, and that, too, in a place where no robbery ever had been committed. She said, that after having been felled with a bludgeon, she was left weltering in her blood ; whereas, I am persuaded, the blow she had received she deserved too well to think of disclosing to us when or how she got it. The blow had been struck obliquely, so as to lay bare a considerable portion of the skull ; and in a few days I could perceive, upon putting my finger upon the scalp, that it was detached to a great extent. The integuments were thin and puffy, undermined with suppuration, and incapable of adhering to the bone, which, though naked, seemed to be sound and fresh. The woman was hale and stout, had never an hour of sickness, nor a restless night. She spoke, ate, sat up, and at last was able to be half the day out of bed. Yet, from the state of the bone, I believed her to be in the most imminent danger, for it became daily more and more discoloured, was yellow on all its exposed surface, black on some points, and thoroughly rough

and scabrous, and by the eighth or tenth day, I could plainly trace with the probe that deep rut which defines the boundaries of a carious bone, and which formed so decided a line, and circumscribed the caries so definitely, that in this, as in Sharp's case, it might have been mistaken for a fracture.

“ Aware of her doubtful condition, I requested the young gentlemen to watch her with particular care, and give me the earliest notice of any signs of danger ; to report to me the slightest headache, or sickness, or even a restless and perturbed night. At last she was seized with symptoms of a very doubtful import, with languor, slight sickness, a corded feeling in the forehead, and a violent cough ; but still I ventured to take this high responsibility upon myself, and defer calling a consultation, lest we should be hurried into some precipitate step. I now plainly saw, that matter began to ooze out by the edges of the carious circle, and was sensible that the carious bone must exfoliate ; but while she retained her health, was able to sit up in bed, had no shiverings, nor the slightest fever, I felt conscious that I was not entitled to perforate the skull, nor even propose the question, and was sure that I could not, without perforating, move the carious bone.

“ While I waited in fear of worse and fatal symptoms, yet in hopes of a spontaneous suppuration, she was one afternoon seized with a paroxysm of her habitual cough, so violent, that she thought her head would rend asunder ; at last she felt, from the violence of coughing, a sudden sense of bursting within her head. The feeling of something having given way was so distinct, that she believed (though she could not imagine how such an accident could

happen) that her cap was torn, and she took it off to examine it; when putting up her hand to the sore, she found it streaming with blood, which continued to run down her cheek. That evening her headache entirely ceased, she had no more of the corded feeling; and, next morning, upon pressing with the probe at that side of the carious bone where the matter seemed to issue through a fissure, the whole to the extent of four inches, a piece the size of the palm, moved easily with the slightest pressure of the probe. From day to day it moved more easily; at last I disengaged and extracted it without the slightest violence, and the little blood that flowed was rather from the tender granulations of the bone itself. The exfoliated part, consisting of both tables of the skull, was nearly four inches long; it had the irregular and indented appearance of a piece, a map pasted on board, and divided into shires and counties for the instruction of boys, and had not the slightest appearance of fracture. As the integuments covering the carious bone were carefully preserved, and the dura mater was in a state of perfect granulation, those surfaces adhered, and she was speedily and perfectly cured, and did not fail, when no longer dependent on me for medical assistance, to persecute me with petitions for another sort of assistance in her tipsy moods; often I saw her, after her cure, outrageously drunk, but never sick; for these are a kind of people to whom, as the Scotch proverb says, 'God is good.'

Thus we have every reason to believe, that the mere separation of the scalp will injure the skull; and the skull, injured thus by the death or separation of its periosteum, may corrupt so slowly, as to do no harm to the dura mater, nor endanger the brain, but

terminate in harmless exfoliation. How else could we account for patients surviving the rude dressings of the older surgeons, the cauterizing, and the scraping with exfoliating irons, till the cranium was thoroughly destroyed? This case affords a most important lesson to the young surgeon; for, had the bone continued firm, the headachs increased, and the brain inflamed, I should have been conscious of having occasioned the patient's death; and, since the separation of the bone was a sort of accident, and the consequence of its not separating would have been certainly fatal, I am almost inclined (however successful) to condemn my own practice.

The great hospital, the Hotel-Dieu, affords us examples of the most barbarous and unsuccessful practice, and (among the numbers whose constitution and natural strength were contending with disease) we meet with the most extraordinary cures, exfoliations, not of pieces of the cranium, but of the whole of it! the dura mater uniting soundly with whatever integuments remain, and the brain continuing in perfect health.

“A poor unfortunate creature was dismissed, in October, 1688, from the Hotel-Dieu, after two years' illness, in consequence of a fall while in a state of intoxication. The upper part of the frontal, the whole of the parietal, and a great part of the occipital bone, having been exposed during the process of the cure, exfoliated in their whole thickness, and were thrown off; so that this great exfoliation resembled the skull-cap sawn off in dissection. Many who were incredulous gave her money to show her head, which she kept always covered with a calibash, or gourd-shell. The pulsations of the brain were

distinctly seen through the thin pellicle which covered it, and which was frequently studded with small vesicles, containing a reddish serum, terminating usually in little ulcers, which, together with her tippling practices, so protracted the cure, that at the end of three years the scalp was not entirely whole.

“The fact seemed so incredible, that often the audience, after Mr. Davenry had shown the bones, and related the case, came to me to be assured, whether I had indeed taken those bones from the head of a patient, and whether she survived *.”

But that a wound of the integuments, naturally slight, and void of danger, may, by such misconduct, cause not merely caries of the bone, but suppuration of the brain, the following incident will prove to you. “A young man of seventeen years of age, was struck in play, by one of his companions, with a small stone on the left side of the head, over the parietal bone. He put himself into the hands of a sort of surgeon, who dressed this slight wound with a heavy hand, cramming it so with rough lint, that the sore rankled and inflamed, with a daily wasting of the integuments. Yet the boy was well in all other respects, went daily to market, and served his master with his usual alacrity. I saw this slight cutaneous wound at the time of his first committing himself to the hands of the barber, with whom I at the time remonstrated concerning his coarse manner of dressing the wound; but he replied, ‘That it was the duty of a surgeon to be cruel, and not faint hearted.’ It was because the wound seemed so very slight, that I gave up attending the lad, but on the eighteenth day, he

* Saviard, p. 388.

came to me of his own accord, desiring me to see how things went on. I found all the surrounding integuments fistulous, down to the bone, and there was one great abscess, full of putrid matter, which could not be emptied but by pressure of the hand. I, of course, advised that this abscess should be opened at its lower part, which the surgeon promised to do.

“At this time I had no fixed quarters, but was obliged to follow the royal army, so that I was prevented from seeing the patient for some time; but, about the twenty-fifth day, I was called to him, and his friends mentioned to me, that the fever which I found him in had continued four days. His eyes were heavy and swelled; he was in a sort of stupor, and was reduced to extreme weakness. The sinus was still unopened, and contained very foetid pus; for this blockhead of a barber had, either through pride or fear, altogether neglected what I advised.

“I had now no reason to doubt that the brain was affected, and proposed that the integuments should be laid open, and the bone perforated, thinking a doubtful remedy preferable to certain death. But the presumptuous fool, when he heard that I had proposed to perforate the skull, protested, ‘That if it were not for the fever, or if the fever should cease, he could make the cure of the wound a very easy matter.’

“On the twenty-sixth day, this young man expired; I requested that his body might be opened, and the empiric consented with all possible alacrity, assured in imagination that his patient’s death proceeded merely from fever, not from any injury of the head; and in this presumption he was hardened

by recollecting, that from the first there was no sign nor appearance of any injury to the bone.

“Upon opening the head, the cranium was, indeed, found free from fracture ; but there was found betwixt the skull and dura mater a considerable quantity of matter, the brain being at that place suppurated, and melted into pus*.”

Thus are we assured, that the mere detachment of the scalp (if it continue detached) will destroy the skull, and endanger the brain ; for, though it has (in the dura mater, and in its own structure) various sources of nourishment, though it is little injured by a temporary or partial privation of blood, yet the permanent separation of the pericranium manifestly kills the skull through its whole thickness. In the older times, when the doctrine of exfoliation prevailed,—when they were in the practice of cutting off the scalp, so as to occasion the death of the skull,—when the separation of the dead part was mistaken for an essential process in the cure, it was reckoned the indisputed duty of the surgeon to procure exfoliation in every wound of the scalp ; and he attained his end, both by holding off the scalp from the skull, and so preventing its re-union, and by scraping and cauterizing the bone.

In modern surgery, nothing is to be seen at all corresponding with this ;—the scalp is never, by any accident, kept separate from the skull. There are no circumstances in which the scalp is more effectually separated from the skull, than in extravasations of blood on the surface of the bone, and none more dangerous to the bone ; for, however violent the

* Botallus, p. 736.

separation of the scalp in cases of laceration, there is in a few days a healthy flap of skin, and a granulating bone ready to unite together, aided by all appliances and means to boot, on the part of the surgeon. But, in the case of bloody effusion, there is, in place of the contact of surfaces, always a fluid, always a foreign body interposed, thence the skull is as naked as if exposed to the outward air. The surgeon, unwilling to open a tumor which he has often seen disappear spontaneously, lingers, and is irresolute ; and when he at last is forced to open it, is conscious, as soon as the blood is evacuated, that the bone is carious, and in part absorbed, and that he sees distinctly the pulsations of the brain.

Children are often born with tumors, produced by the pressure of the bones of the pelvis upon the prominent centre of the parietal bone, or by the pressure, in the course of the dilatation, of the orifice of the womb, especially in a first labour, and in a woman advanced in years. Yet these effusions of blood do not always corrupt the bone, but usually disappear in a few days.

Very frequently careless nurses, or idle mothers, leave their little children asleep on a high bed, and when they awake, and begin to toss and cry, they, if not immediately attended to, fall out of bed, head foremost. I have very frequently been called to children who have fallen thus from the carelessness of nurses, and often the fall has been so violent, that the mother, just before she heard the child's screams, has distinctly heard its fall from an adjoining room. I have seen the effusion so great, as to raise a tumor which you could hardly cover with the palm of the hand, and apparently containing three ounces of

extravasated blood ; the child meanwhile lying in a state of stupor. Yet, the stupor is merely from the child having fatigued itself with crying, and such tumors usually disappear. Many as I have seen, I do not remember one which required to be opened, and remember one only which ulcerated the scalp, and burst, after destroying the bone. That child, which I attended, along with Mr. Lawson, surgeon, lost a piece of the parietal bone of considerable extent, but did not suffer in its health.

More formidable effusions of blood happen in rambling school-boys ; and they are of such a description, as might tempt the inexperienced surgeon to open them. Whether from opening such tumors any ill consequences might result, I shall not venture to predict, and do not by experience know. But of this I am assured, that if left alone they are generally safe ; that if the young surgeon were to yield to the suggestions of his own fear, whenever in those cases he imagined he felt a depression, and were upon this presumption to cut open the integuments, and trepan the skull, the issue of his adventure would be very often fatal, and many a boy would be, as some have been, “killed by art, for want of art.” The deception proceeds from this peculiarity, that where the vessels ruptured by the fall have made the greatest effusion, the blood continues long fluid ; and if there be one large artery burst, and the tumor has a degree of pulsation, it continues always fluid ; but, towards the margin of this cavity, where the cellular substance is not entirely detached from the pericranium, the blood is so injected into the cellular substance, and mixed with its fibres, that the basis and margin of the tumor are uncommonly firm, and the hardness

such as actually to resemble that of bone. From this hard circumference, the surface apparently declines towards that part where the cranium is more distinctly felt through the fluid blood ; and the declivity is so distinct, and the hardness of the margin so entirely resembles that of the centre, where the skull is felt unequivocally, that the surgeon has not the slightest doubt that he feels a wide and deep depression of the skull ; and when along with this the boy lies oppressed, and vomiting, he can hardly refrain from opening the tumor, or think himself vindicated in leaving the boy without help.

I know no deception which experience so effectually corrects as this, of an apparent depression felt through a bloody tumor of the scalp ; nor can any thing but experience correct it ; for to the sense of touch, the depression is so palpable, and the boy's danger so very obvious, that even an experienced surgeon, on any new occasion of examining such a tumor, is confused with the very peculiar feeling of that deception, which he is already aware of. Many times I have been called to rambling boys, who had fallen in climbing walls, or in playing about saw-pits, and unfinished buildings ; and have often found them with great effusions of blood over the parietal bone, and apparent depression ; the face ghastly, and the extremities cold, in a state of insensibility, with the eyes not closed, but turned upwards, as in the convulsions of children. But, fortunately for me, the case of the boy that I first saw lying in this stupor, in the earliest part of my practice, was so perfectly decisive, that I have never since been in danger of any precipitate step ; for this boy, who had fallen from a garden-wall, lay in a state of absolute stupor,

and with a degree of convulsion, during four days. He vomited incessantly, and his extremities were cold, and his face ghastly. The appearance of depression was so striking and singular, that I made not the slightest doubt, that if he did recover without any operation, manifest marks of depression must remain. But he recovered in a few days perfect health and spirits, and the appearance of depression vanished as the blood was absorbed. In short, these effusions are very general, even when of the largest size, mere bloody bumps, which, like Squire Richard's, require only vinegar and blue paper.

Three years ago, I visited, with Mr. Cheyne, surgeon in Leith, a boy whose situation seemed absolutely desperate. He had fallen headlong from a corn-loft upon the rudest pavement I have ever seen, consisting of big, polished, and prominent stones. The depression seemed too obvious to be disputed. The boy vomited incessantly, and lay in a state of stupor, unless when he cried out in his delirium, for he continued delirious for many days. He often threw himself backwards in his mother's arms, reclined his head, and stiffened, as in a convulsion. Yet this boy was spared the cruel and dangerous operation of trepan; recovered with very little assistance on our part, farther than was merely necessary to amuse the parents; and is now in perfect health.

Thus we are conscious, that all effusions of blood are not under the pericranium; that the blood is often effused among the layers of the pericranium, muscular aponeurosis, and skin, in short, of the common cellular substance, and is absorbed, without danger to the bone. But when the blood is effused under the pericranium, separating from the bone those mem-

branes, and that cellular substance which should nourish it from without, the bone must die ; not by that peculiar power which has been long ascribed to blood, of dissolving bone, but by acting as a foreign body, and separating one natural surface from another.

I know not whether any specific and unalterable rule can be proposed for the treatment of cases so various in their forms, their causes, and probable effects, but something I feel inclined to say on this subject. First, Effusion of blood among the layers of the scalp and pericranium, of whatever form, and with whatever symptoms attended, is not to be rashly touched. The blow, and general shock which occasions this suggilation without, is, I am persuaded, accompanied with a degree of effusion within. A boy may lie stupid from such a shock without danger, and time must be allowed for the operation of the natural powers, and the absorption of the internal effusion, as well as the dissipation of the external tumor. But let it be a rule with you, never even to think of incisions, nor permit them to be mentioned in your presence, while the effusion has the character of mere suggilation, or *euchymosis* ; *i. e.* while the blood is diffused among the cellular substance, with little sense of fluctuation, and that little lessening every day *. Such are the effusions in the scalps of new-born babes, and children who have had slighter falls from the bed, or cradle. Secondly, When the tumor assumes the proper form of aneurism,—when there is a large and circumscribed tumor, fluid blood in the centre,—a hard basis, and margin,—a distinct pulsation through the whole tumor, and its size in-

* Mr. Petit says, p. 88, “ Rien n'est si commune que le bosse à l'occasion d'un coup à la tête : elle n'est souvent qu'un bagatelle.”

creasing from day to day, there is great danger to the skull. The tumor should be laid open without delay, and dressed with lint; and it will, after two or three days of suppuration, (in which the matter will be foetid, from being tainted with the blood,) heal kindly; for the arteries of the scalp, when thus bruised, and pouring out blood, have sufficient force to maintain, or even to enlarge, the effusion of blood which cannot be absorbed, in opposition to such a cause. Yet, when opened, such arteries do not bleed much, the hæmorrhagy is suppressed merely by applying a bit of lint; they rarely need to be tied. Thirdly, Effusions of blood, though unaccompanied with pulsation, if they continue fluid, and do not gradually subside from the period of the sixth or seventh day, must not be regarded as of a slight or indifferent nature, and, before the tenth or twelfth day, should be opened. From all the experience I have had, these rules of conduct will be useful to you; and while I warn you to refrain in general from opening such tumors, it is also my duty to state unequivocally and plainly, that there are others which occasion caries of the skull, where a little imprudence, a little delay, endangers the patient's life.

“Mr. Harrold, partner to Mr. Wilmer, had a boy brought to him, of fourteen years of age, with a tumor on the crown of the head, the size of a hen's egg: it was seated on the middle of the sagittal suture: it was occasioned, as his father related, by a blow, the boy having been struck over the head with the arm of a broken chair: the swelling ensued immediately after the blow. The father had flattered himself with hopes of its dissolving by time, and the simple remedies recommended by his neighbours;

but about two months after the blow, he brought the boy to Mr. Harrold, the tumor undiminished, and containing, according to Mr. Harrold's apprehension, nothing but blood. As a measure of precaution only, and without apprehending the disorder which had already been produced, he opened the tumor with a long incision, and discharged a quantity of blood, yet fluid, and not in the slightest degree grumous nor blackened; and, as the artery from which it had flowed was still open, and a considerable hæmorrhagy ensued, he dressed the cavity hastily with dry lint.

“ On the second day, he removed the external dressing; but, not choosing to risk a second hæmorrhagy, he left the lint which adhered more immediately (and very strongly) to the surfaces, untouched. When this also was removed at next dressing, much ichorous and putrid matter was discharged, and, upon looking into the bottom of the cavity, was surprised to perceive distinctly the pulsations of the brain, and that the bone was entirely wanting in all that part which corresponded with the basis of the tumor, a space of two inches in diameter.” The danger of this boy, then, was most conspicuous and imminent; fortunately the dura mater granulated, and the opening healed kindly.

Such are the dangers proceeding from delay. See a similar case, of a boy, by Mr. Hill of Dumfries.

Before I forsake this subject of injuries external to the cranium, I shall represent to you one which is attended with no danger of caries, but relates to the scalp only, a nervous and most singular disease; resembling that which arises from some injury in bleeding in the arm, attended with little danger,

but marked by convulsive motions, nervous affections of the most undefinable nature, and sometimes with agonizing and periodical pain ; pain varying according to the state of the weather, or the patient's health.

“ The man whose case I am going to relate to you, was about thirty-two years of age, sallow, sickly, and, I fear, dissolute. He had lost his health, his industry, and his morals, by an unfortunate blow on the head, which had deprived him of reason for many months ; and, after a second blow on the head, he suffered, in consequence of the sewing of the temporal artery, a very singular nervous affection.

First, about three years ago, he was attacked by some drunken companions of his own, who way-laid him in a dark passage, and knocked him down. He fell backwards into a cellar-stair, struck the back of his head against the stones, and was carried to the hospital senseless ; where, notwithstanding every care of the surgeons, he lost his reason, continued many months insane, left it at last in a weakly and languid state, ill able to return to his hard labour, that of pressman in a printing-office. From that time he worked little, and irregularly, became a miserable vagabond, subsisting chiefly on charity, and living among his friends.

“ About three months ago, as he was coming down an open stair, which had no hand-rail, he fell over the stair, and lighted among sharp stones, and his forehead was laid open with a ragged wound, about four inches in length, extending from the forehead to the temple.

“ The stair was notoriously dangerous, and the night dark, but he confesses that he was a little tipsy. Nothing so surely indicates a vagabond and idle life,

as indifference to cleanliness and health ; he did not return to his old asylum, the hospital, but, with a penny-worth of Wade's balsam, and some filthy apparatus of rags, made a fashion of dressing his wound, till, by filth and neglect, it ulcerated ; the temporal artery was eroded ; the blood sprung briskly from the corner of his sore, and thus he was brought to the infirmary.

“ The house-surgeon sewed the artery ; he was laid in bed, and enjoined not to stir, lest it should burst out again. He was very timid by nature, and the students took a pleasure in alarming him from time to time, with saying, that it would surely burst out again. About a fortnight after, the ulceration still extending, the artery was again eroded ; and at night, betwixt ten and eleven o'clock, when turning gently in bed, he felt his forehead moist ; and, upon putting up his hand, found it wet with blood. The artery soon began to bleed *per saltum* ; and the house-surgeon being called, the artery was again secured, by striking a needle and ligature under it.

“ After the first sewing of the artery, he felt nothing unusual ; but after this second stroke of the needle, he found, next morning, his mouth pursed up and contracted, his jaws so clenched that he could not speak, while spasmodic contractions extended along the neck and throat. His cheeks were flattened, and his mouth pursed up, and at the same time protruded as in a ludicrous simper, or like one attempting to whistle, and prevented by an inclination to laugh. The form of the face was remarkably changed ; the sphincter oris pursed up the mouth, while the zygomatic and triangular muscles retracted the corners of it, and made the dimple natural to

that part very deep ; the cheeks were flattened, the mouth protruded ; when he attempted to speak, which he did imperfectly, the whole face was agitated, and his tongue got entangled between the upper and lower ranges of teeth, so that he imagined, if he persisted, he might bite it across ; and the throat and the whole neck was obviously contracted in a spasmodic state, accompanied with remarkable pain ; and he could not open his jaws to receive the smallest particle of solid food, but lived on spoon-meat."

This fellow's face was drawn into such a ludicrous simper, that he was suspected of being an impostor. If so, he was an ingenious one,—since it required some knowledge of our profession to invent spasms, so naturally accompanying a puncture of the scalp,—and a facetious and a merry one, for I never saw a physiognomy, nor contortions of face, so very ludicrous. The persevering composure and gravity with which he sat up in bed, the principal actor to a much amused assembly of spectators, was not art ; he might indeed clench his jaws voluntarily, or purse up his mouth, but I know no power by which he could contract the muscles of his neck and throat, and keep them in a rigid state asleep or awake. Nor is the luxury of being fed with bread and water from a spoon any great temptation to linger in an hospital. We very often, from slight wounds of the scalp, see spasms and contractions of the face and neck in those who lie under no suspicion, and pains continuing for months after such wounds are healed ; we find that a smart incision cures them, which would be a severe retaliation for any intended fraud, and a good preventive against any such practical jokes. I have

several times been a party in consultations, where epilepsy had, in boys under eighteen years of age, followed sometimes severe, and sometimes slighter wounds of the head; and in which the epilepsy was connected with particular feelings in the scalp, as it often is preceded by an aura, or undefined coldness and convulsion running along a particular limb; and, though an incision does not always give relief, the keeping an issue in the wound, and thus exhausting the irritability of the part, usually does.

Any wound, surgical or accidental, in any part of the body where nerves are injured, especially where they are exposed, will produce the same disorders. In Hydrophobia, the convulsion is plainly connected with a painful state of the wound *; in locked jaw, the convulsion usually comes on when the wound heals; after an amputation rudely performed, or ill cured, where the extremities of the brachial nerves are engaged in the cicatrice, most violent convulsions often seize the mutilated member; it starts night and day with such violence, as to allow the patient no sleep nor rest; and this pain and convulsion returns in paroxysms, and continues for years. First the stump inflames, then comes on a violent accession of fever. Then the starting begins chiefly when warm in bed. I have seen the point of an amputated humerus swell to the size of a buttock, accompanied with such painful convulsions, that I was afraid of them bringing on some epileptic disease; and, without exfoliation, or ulcer, or any obvious change, the pain and convulsion subside again. I have remarked,

[* I am confident, that in the two cases which came under my care, there was no irritation whatever in the wound, that is to say, no sign of it in pain or inflammation.]

that after extirpation of the cancerous mamma, or of schirrous glands, the returning disease is preceded by such nervous affections, extreme sensibility, and periodical pains in the wound;—a sure prognostic that it will burst out again in horrible ulceration, and that the patient will die*.

Other singular cases of anomalous nervous disorders, arising from wounds, I shall reserve for a fitter occasion; observing only, that spasms and pains, occasional swellings of the head, and clenching of the jaws arising from punctured wounds of the head, need no more surprise us, than such swellings of the arm, contractions of the finger, and capricious nervous afflictions, arising from punctures of the lancet, or even of a needle, or such trivial wounds as that which I have described. I find slight notices of this disorder arising from wounds of the scalp, or circumstances which suggest to me that it is frequent (though not remarked) in almost every book I read.

In Wepfer, I find an interesting case of one Conrad Mejer, a lad of nineteen years of age, apprentice to a blacksmith, who was struck by his comrade with his pincers, with such hearty good will that the

[* In the Middlesex Hospital, I have seen a good deal of this; several patients having of late come into this house to suffer a second amputation, in consequence of the irritability and sensitiveness of the face of the stump. The distress in these cases has been owing to the nerve being engaged in the cicatrix, and the skin of the cicatrix being, from time to time, stretched over the face of the bone. I have found it best to make a circular incision, including the cicatrix, down to the bone, at once, and then to saw off the end of the bone, so as to sink the remaining extremity of the bone deep in the flesh of the stump. It is an exceeding painful operation, but I have never heard more warm expressions of gratitude than a patient relieved by such means.

The author has here introduced a long case of nervous affection, which I have omitted as not german to the matter.]

part of the handle of the pincers, about as thick as the little finger, stuck in the skull, near the angle of the os frontis. Yet he did not fall, but pulled out the piece of the pincers with his own hands. He lost no more than seven or eight ounces of blood, and the wound was dressed by his master with some styptic powder. I shall not detain you with the further narrative concerning the treatment of the wound, how small it was, scarcely admitting the point of a quill, or how little dangerous, till it was crammed with tents and digestive ointments, and closed up with plasters;—how more profuse the bloody matter seemed, when compared with the depth of the wound;—how the wound became fistulous, and admitted the probe to pass under the temporal muscle;—nor the various changes in the appearance of the wound, in the sickness, or other symptoms. Suffice it to say, that by its own nature, and by bad surgery, the sinus continued long open; that while its orifice contracted the matter accumulated, the scalp and eyelids swelled, and the glands of the neck inflamed;—that a caustic was applied, and the sinus changed into an open sore;—that then the cranium was found bare, and the probe seemed to penetrate through the temporal bone.

Three or four months passed in the cure of these fistulous sores. “Wepfer saw the patient again in the ninth month, when the wound was entirely healed, and there remained only a swelled gland behind the ear, which disappeared when the pain ceased. At the year’s end, he was perfectly well, and as free from glandular swellings as from pain; the wound seemed soundly closed, and had remained so for many months. Then it opened. He dressed it with

a turpentine dressing (*lachrymam abietis indedit*; he dropped into it a drop of the exudation from the fir-tree), it remained open only fourteen days, and when it healed the pain again subsided.

“ At the distance of four months from this time, the patient felt for two days a sense of creeping, running up the arm, from the elbow to the shoulder, night and day; and, on the third night, while in bed, he felt a chillness like ice, or snow, run along the arm and fore-arm; and, after having three times had this particular feeling, he was seized with a convulsion of the mouth and left cheek. During the following night, he was again assailed with the same disorder, which lasted while he could repeat a prayer, and returned four times; and from this time it returned often, during both day and night, with intervals sometimes of several hours. While the convulsion lasted, the saliva flowed from his mouth, and he had occasion to observe, that this was increased by cold. In ten days more, the convulsion was so far increased in strength and frequency, that he was often interrupted in eating, and day nor night had no rest. The head was turned to one side, and the mastoid muscle was seen trembling with a sort of convulsive motion. After this, he procured some kind of oil from a quack, and with a feather he anointed the afflicted arm, and the neck, and took of it inwardly. After this, the arm felt as if mice had been crawling along it. The head was agitated with a convulsive motion, backwards and forwards. The convulsion of the mouth lessened, while the shock of the general convulsion was so great, as to precipitate him from his stool under the grate. In this desperate condition did he struggle from early in the morning

till mid-day. He preserved his senses all along, but, after the violence of the convulsion was over, fell into a sort of oppression and languor. He fortunately discovered, that he could by hard labour prevent the convulsion. From this time he had no more fits. But still the feeling of cold, and creeping continues, and he prevents it terminating in any violent attack, by working at the anvil. I prescribed Valerian powder, says Wepfer, and found him still well at the end of the ninth month."

[Some of the cases lately brought to the Middlesex Hospital and to my house, under the notion that they might be illustrated by my discoveries, have exhibited similar symptoms to those described here. In particular, I have notes of two cases in which the operation of trepan had been performed, leaving the apertures of the skull open, and the integuments healed, but stretched over the bone. The cases have some analogy to those which I have given in note to page 500, where the consequence of the nerve of the stump being engaged in the cicatrix is noticed.

A child, while in the nurse's arms, was hit on the head by a stone from the cliffs overhanging the sea. The child's life was preserved, but with a very considerable loss of bone; the integuments healed over the aperture of the bone; but a twelvemonth after an apparent cure, the child became subject to fits, which soon assumed the character of epilepsy.

In a young gentleman who had suffered the operation of trepan, and where the integuments were firmly stretched over the aperture of the bone, and entirely cicatrized, he became, after a considerable time, subject to fits of an epileptic character, and which he himself, as well as all he consulted, attributed to

the wound. Two circumstances attracted my notice in these cases : an excessive sensibility of the integument, and the pulsation of the brain against the edge of the bone. To which of these circumstances are we to attribute the convulsions ?

In such cases I have advised the careful compression of the brain, or rather its support, so as to prevent the effect of sudden impulse of refluent blood upon the brain ; and, in the next place, I have recommended that the integuments be divided with a circular incision, so as to cut through the superficial nerves.

Every day's experience, however, evinces the necessity of attending to the state of the constitution in these cases ; for undoubtedly some defect of the operations of the stomach, or of the liver, or of the uterus, has its influence even where we can trace the connexion betwixt the wound and the train of symptoms.]

On various occasions, I have suspected that disease to be in the scalp, which was attributed to the skull, for I know not how symptoms of a nervous complexion, amounting even to epilepsy, could arise from the skull, or be cured by exfoliating a rough or blackened piece of bone. “ A girl, of fifteen years of age,” says Mr. Gervais, “ fell, in going down stairs, struck her occiput, and lay without sense or motion, bleeding from the nose. The head-ache continued several years, for which she was repeatedly bled, though not much relieved by these bleedings. There remained a fixed pain in the back of the head ; during fifteen days it was supportable, but then increased, and returned in regular paroxysms. When she rubbed the

occiput strongly with the hand, she fell into a faint, and, from the time that the pain of the head had increased, she had suffered daily eight or ten attacks of epilepsy.

“Mr. Gervais, in examining the pained part, remarked a small blackened spot on the upper and middle part of the occiput, and there the skin appeared soft and tender; and Mr. Gervais pressing by chance with his finger upon that spot, somewhat rudely, the girl fainted. He could not conceive that such slight pressure could be the cause of her fainting. When she recovered, he again began to finger the part, and upon pressing with the finger, she again fainted. It was then only that he suspected he was himself the cause of this syncope; and, upon pressing with the finger a third and a fourth time, she fainted every time he drew it across the livid spot. Having failed to relieve this girl by the ordinary remedies, it was resolved, in consultation, to make an incision. They found the pericranium detached, and the bone affected; and the symptoms still continuing, Mr. Gervais was in doubt whether to trepan, or to expect relief from exfoliation; and, fortunately, the bone no sooner exfoliated, than the girl was entirely relieved.” The periodical return of this pain,—the periodical pain being followed by epilepsy,—the epilepsy being relieved by a continued suppuration of the part, in which the exfoliation was perhaps an accident or the effect of art,—proves to my mind that this was merely an injury of the scalp. Nor can I find any difficulty, while we see such periodical and distracting pains of the face, in *Tic douloureux*,—in wounds of the frontal nerve,—in punctures of the nerves of the arm, or ancle, in bleeding,—or, in the exposure of nerves, in

the cicatrix of a scar, or wound, in ascribing these symptoms rather to an injury of the scalp, which may excite nervous disorders, than to a caries of the bone, which we see daily unaccompanied with those anomalous symptoms.

There is one circumstance more which has often struck me as singular. I mean the extreme depression of bodily strength, and dejection of spirits, which often follow an injury of the scalp. I have seen patients fall into a sort of hypochondriasis, from which no exertion of spirits, nor native good sense, could extricate them. The case of the Chevalier d'Enragues, an officer of rank in the French service, is a lively portraiture of what every observing practitioner must have remarked in cases less singular.

“The Chevalier d'Enragues, Colonel of the regiment of Bagey, was quartered,” says La Motte, “in our city; and, on entering his house one day, he struck his head against the door-post, but so slightly that it merely knocked off his hat, and he felt nothing but the slightest pain. Yet, slight as the pain was, he passed a sleepless night, and in the morning requested my advice. I found him low, with a feeble pulse, and a slight pain in the head, at the meeting of the coronal and sagittal sutures. I bled him freely, and as upon shaving the head I found no mark of violence, no contusion, ecchymosis, nor even redness of the skin, I thought it sufficient to embrocate his head with oil of roses, and spirits, laying over all a compress dipped in hot wine. He so entirely lost his appetite, that he could take nothing but an egg, or a little soup, and he was confined to bed, with a sort of vertigo. I was obliged to bleed and purge him, and give him a tea made of vulnerary herbs. I

bled him thrice, and the pain gradually lessened, till in ten days it vanished."

"He now proposed to call Mr. Troublet from Paris to visit him, but the memorial which I wrote to Mr. T. was so satisfactory to him, that, having commended my proceedings, he declined to come, and committed the entire care of this gentleman to me in the most flattering terms. Yet, slight as the occasion of this disorder was, he was long in so low a condition, that I was alarmed for his life. He was extremely feeble, melancholic, and sorrowful, and continued in this condition four months."

This case he concludes with the following reflections: "There was not, perhaps, in the armies of France, a more spirited, nor a stouter man, than Le Chevalier d'Entragues, who yet had nearly died of an accident seemingly very unimportant. For three months, the symptoms were as ominous as in the deepest and most dangerous wounds; consequences which assuredly had arisen from the pain of the periosteum, communicated through the sutures to the dura mater and brain. By these communicating fibres of the pericranium, the nervous system was irritated, so that the animal spirits, moving no longer in their usual regularity and order, the patient's whole system was weakened, and was re-established when the spirits were made to resume their due course, the soul then finding itself free." "To the oil of roses I had joined spirits of wine in the embrocation; that by the subtilty of the spirits in opening the pores, the oil might be enabled to penetrate deep, and relax the tense and distended fibres of the periosteum, which communicates through the sutures with the dura mater, in which consists the painful

affections of the part, and the consequent disorder of the animal spirits*.”

This gentleman died afterwards at the siege of Cremona, leading on the French troops with great bravery ; and in his case, Mr. La Motte seems equally proud of his philosophy, his school-learning, and his practice ; but it is not to expose these that I quote his words, but to prove that the impression rested on his mind of this being an injury of the pericranium, and that the complaints were nervous, as truly so as if they had been accompanied with convulsive and thrilling sensations, mentioned in the other cases. However you may construe the case, whatever judgment you may be inclined to form of the strict regimen, and profuse evacuations, of which I cannot approve, it is fit you should be acquainted with this hypochondriacal lowness which so often follows wounds of the head, and is more frequent than epileptic or nervous feelings. It is a phenomenon which will often present itself to you, and you will remember it as the cause of those idle speculations of the ancients about the nervous nature of the pericranium, and its communications through the sutures with the brain.

Nothing is wanting to complete the history of these singular affections, so plainly resembling the *Tic Douloureux*, and the injury arising from bleeding, but a proof, that the incision which, in the present, as in those other nervous complaints, brings relief,

[* The fact is most important ; the reasoning partakes of the theories of the time. We have daily occasion to remark the intimate connexion betwixt the integuments of the head and the stomach ; and as a necessary consequence, the dependence of the mind on the condition of the wound.]

neither opens any latent abscess, nor uncovers any corrupted bone, and can have, indeed, no possible effect but that of cutting across the morbid nerves. “Magdelaine Mondet, a native of Lyons, twenty-two years of age, and married, was attached with her husband to a troop of Charlatans: while they were exercising their craft in a little village in Dauphiny, her father, in a fit of anger, threw a stool at her head, and struck her behind the ear, immediately above the mastoid process: though there was no outward wound, she fell down, lay insensible, and all the symptoms were so alarming, that a physician from Grenoble, who visited her four days after, declared that she should be trepanned. She recovered, however, without any operation, except that a pain continued, which extended from the injured part to the forehead and orbit. From this period, during four years the pain gradually lessened; at the end of which period she again returned to Lyons, apparently in perfect health. Some time after her return, she was attacked with a severe rheumatic pain of the wrist, opposite to that side of the head in which she had received the injury.

“After some violent altercations with her married sister, she abandoned herself to such excess of fury, that she resolved instantly to drown herself; and, being overtaken and held, she fell down without sense or motion; and when she revived, was paralytic on one side, that opposite to the original injury, and it was accompanied with loss of voice, difficulty of deglutition, and even an oppression of breathing. In this condition was she carried to the Hôtel-Dieu, where, by bleeding, baths, blisters, and other means, she recovered her speech, her breathing became easy,

but still, to the very end of her complaint, she faltered in her speech, and the paralysis continued, with a total loss of sense, as well as motion, in the parts. A month after her admission, the palsy affected the right leg also, and gradually the whole body, except the right arm, the neck, and that side of the head. Though she faltered much in her speech, she was intelligible, and her chief complaint was of vertigo, and of violent pains in the right side of the head, round the right eye. But this happily continued but a fortnight, when she recovered by degrees, first the power of the right side, then her sleep, appetite, and spirits, and in fifteen days more the left side also was so free, that she could walk through the ward with the help of stilts.

“ We believed this woman quite restored, when, in the third week, she had a relapse more alarming than any of the preceding. She became universally paralytic, speechless, and motionless, the neck, and one half of the face, only remaining free ; but this lasted one day only, after which she began to mutter. The difficulty of breathing and swallowing were as great as ever ; and she soon fell into a raging delirium, accompanied with convulsions ; and during this fever she so far recovered the use of her right hand, as to rid herself easily of those who attempted to hold her. The convulsion was so violent, that from time to time her head was so bent down as to touch her feet ; and more than once she would have projected herself from the foot of the bed, and struck her head against the counterpane, if she had not been confined in a strait jacket.

“ She struggled three days in this furious condition, and appearing on the third day to be near her end,

the last sacrament was administered. On the fourth, the delirium ceased ; and on the morning of the fifth, I saw her, and, struck with the capricious and anomalous nature of these signs, I repeated many of the questions which I had formerly asked, and now, for the first time, she mentioned, amidst a variety of replies, that she had formerly got a blow on the back of the head. I requested to see the place, and found it covered with hair as long and beautiful as any other part of the scalp ; and, pressing with my thumb rather strongly along the part, to see whether there was any swelling, she was seized with a more violent convulsion than we had yet witnessed ; she even fainted ; and, upon repeating the pressure, it produced a convulsion as violent as a shock of epilepsy. She foamed at the mouth more than usual, and complained that the violence of the pain she had suffered seemed to shoot through the head from the part pressed upon to the angle of the eye. I told her, that since physic seemed to have no power over her malady, it appeared to me that she had no resource but in operation ; a suggestion which, from her extreme sufferings, she received with pleasure. When I communicated this information (hitherto unsuspected) to the physician, Dr. Chol, he did not oppose my intended operation.

“ I ordered the pained part to be shaved, an operation very difficultly completed, for the drawing of the razor over the part excited the convulsions. The shaved part was of a lively red colour, which I could not but ascribe to the razor, since there was no swelling. Well assured that the contusion of the cranium was the root of the evil, I made an incision behind the ear three inches long, extending from the mastoid process upwards. The incision went to the

bone, excited no convulsion, was followed by no hæmorrhagy, and was dressed lightly with charpie. Half an hour had scarcely elapsed, when a sister of the house came running to inform me, that she was perfectly cured, that she had risen without help, that she now spoke and swallowed with ease ; and indeed I found her report true, and had pleasure in seeing this unhappy creature without the slightest remains of her palsy*.”

Unless respectable authors have been so abandoned as to invent these details ; so ingenious and skilful in lying, as to have contrived circumstances the most singular, inconceivable, indeed, by any preceding analogy ; we have all the proof we could desire of these anomalous, and very afflicting symptoms, arising from slight bruises of the scalp, and continuing and increasing for an indefinite term of years.

“ A young man,” says Pouteau, “ twenty-four years of age, with every mark of sound health, fell from a window twenty feet high, and lighted on his head. This was at the age of eight years, and he lay for many hours without sense or motion. He was bled, the usual applications to the hurt part were not neglected, and he was entirely cured, saving only a painful feeling which continued in the part of the scalp that was most bruised.

“ The period of his disorder is much too long for him to recollect definitely every fluctuation of it ; this, however, he cannot but remember, that he has ever since been afflicted with unremitting pains of the head, which some months ago, when he first consulted me, became so poignant, that often he fell

* Pouteau, p. 282.

down senseless in his chamber. By all that he says, I understand that his most acute pains are in the upper part of the right parietal bone, extending to the angle of the eye, the sight of which is obscured during the more violent paroxysms of pain ; and all the face, but especially the right side, is flushed with a painful and burning sensation.

“ His hair is long and beautiful ; an ornament which costs him dear, for every time the comb passes over the hurt part, the pains are excessive. The hairs are, at this part of the surface, peculiarly coarse and strong ; they do not lie naturally, as in the other parts of the head, but bristle up in a most irksome way, when any accident excites the severe pains.

“ The head being shaved at my request, I perceive a degree of swelling, slight indeed, but accompanied with redness. The pressure of the finger leaves no mark, but excites acute pains. I laid open all the affected part of the scalp and pericranium with a great crucial incision, and, having allowed a cup-full of blood to flow, dressed it up. From this time the pains ceased, and in a few days entirely vanished, in consequence of a serous and bloody discharge.” These are a few of the observations concerning this interesting subject, which I have thought it my duty to lay before you. They are enveloped in a thick husk of doctrine about nerves, and spirits, and humours, which I will not weary you by translating. I would neglect nothing so remarkable, so peculiar as this, and yet would spare you every uninteresting detail. Having pointed with deliberation, and, I hope, with precision and clearness, the various injuries of the scalp, I hasten now to a subject more

interesting in an infinite degree ; I mean, the consequences resulting from separation of the dura mater from the internal surface of the skull.

[The subject of this chapter suggests a remark which may prevent fatal consequences. After trepan it has been two or three times recommended to me to open the wound again, and to take away a piece of bone. I must repeat here, what I have had occasion to say on these occasions, that such an operation is particularly dangerous. For the consequence of the previous operation of the trepan is to cause a consolidation of the bone and dura mater ; and when you think to raise the bone, in a second operation on the same part, you do more,—you tear the dura mater, and expose the brain ; and then follows inflammation and suppuration, and perhaps fungus cerebri.]

OF SEPARATION OF THE DURA MATER.

The blow which detaches the dura mater may, at the same time, injure the integuments, or affect the skull ; hence nothing seems more difficult than to ascertain the simple consequences of separation of the dura mater, unallied with injury of the integuments or cranium. Yet I hope I shall be able, by a suite of facts, to prove, that the dura mater may be separated even by a shock, without any direct injury to the scalp, or skull, and to explain to you all the varieties of this accident, and all its remote and unforeseen consequences.

“ A little boy, of five years of age, fell from the first story of a stair, but lighted on his feet, and walked up stairs again, saying that he was not hurt ;

no importunities, questions, nor threats on the part of his parents, could ever extort from him any other answer, than that he was not hurt ; indeed, they had little reason for their anxiety, the boy appearing to enjoy, for three months, the most perfect health. But, at the end of the third month, he was seized with a violent headache, accompanied with a puffing up of the eyelids, and fits of vomiting ; and, when the surgeon was called, he found the face suffused with a purple colour, and the boy deprived of speech, and able only to point with his hand to the place of the pain. He was bled in the arm, without loss of time ; he grew worse, and was, a few hours after, bled in the leg, but almost immediately, and before the orifice was closed, he expired.

“ Mr. Casaubon being called to open the body, found without the cranium nothing particular, except a slight puffiness of the integuments ; but, on opening the skull, he found an extensive abscess betwixt the dura mater and the inner surface of the right parietal bone ; but neither within the skull, nor in any other part of the body, was any thing remarkable observed.”

Here we have presented for our consideration, in a short plain narrative, a suite of most important facts. First, A boy falls from a great height upon his feet, as it would appear, in the presence of his parents, but certainly upon his feet ; and the dura mater is detached, not by a blow, which might at once injure the cranium, and shake the dura mater ; it is detached by the shock merely, without any concomitant injury of the skull. Secondly, The integuments being sound, the cranium unhurt, the parts not disposed to run quickly into disease, the child continues in perfect health, and when he is suddenly seized with the fatal

signs, there is still no conspicuous swelling of the integuments ; and, when he dies, the cranium is found in its natural state. Thirdly, It is remarkable, that here, as in almost every instance, the suppuration of this membrane is slow and insidious in its progress ; for this boy had continued three months in apparent health, no symptoms betrayed the danger ; the parents had dismissed their first anxieties and fears : yet all the while this fatal suppuration was ripening. The boy, the moment he is seized with the stupor, is gone, past remedy. The trepan could not then have saved him ; the cause of this sudden and fatal convulsion was discovered only after death. Fourthly, Though the suppuration was of considerable extent (*un absces considérable*), it had plainly arisen from the mere separation of the dura mater ; for the dura mater alone was affected : long as it had been divorced from the cranium, neither was the cranium affected by this separation, nor the brain by the disease of the membrane which immediately surrounds it ; the separated surface was alone purulent.

Yet I should not, Gentlemen, ascribe such importance to a solitary case, nor attribute such singular and unforeseen consequences to this general shock, were it not easy to prove the same fact in various ways. From the tender age of this little boy, he might have been unable, perhaps unwilling, to tell how he was affected by the shock ; but others, more intelligent, have been immediately conscious of the injury.

“ A healthy man, born of sound parents, and about thirty-five years of age, fell, in the month of December 1766, in going down the steps of the side pavement of the Pont-neuf. His feet flew from under

him ; he fell perpendicularly on his breech ; and it is a well-attested fact (*c'est un circonstance bien constatée*), that his breech only touched the ground, and sustained the shock ; and it is not less remarkable, that the moment he fell he felt his head so confused, that he could hardly get up. His fall was followed by no kind of pain. Mr. Dupouy, a member of the French Academy of Surgery, knew him well, and had this relation from his own lips, was consulted by him about these first consequences of this concussion, and suggested some measures of prudence, to which Mr. Gallois (the name of the patient) seems to have paid but slight attention. The confusion of head continued unremittingly during four months, after which period it insensibly vanished.

“ After four months or more of undisturbed quiet, his barber, in shaving his head, observed, in passing the razor over a particular spot on the top of the head, a dull sound, which seemed to him very particular ; it was a sort of crepitation, like that of crumpled paper, or parchment, lying under the scalp ; and, upon mentioning it to Mr. Gallois, he was sensible, upon touching the part, of the same singular feeling. At this time there was no inequality, neither rising nor depression of the part ; the next day there was a tumor, the size of a half-crown piece, slightly elevated, and having a degree of pulsation ; and, as it increased remarkably from day to day, he consulted several, and at last took the advice of one, who declared it an aneurism, and advised compression. A compress and bandage was applied ; the tumor was easily repressed to the level of the perforation, in the parietal bone, but its pressure occasioned the most alarming insensibility. The compress was abandoned

—the tumor grew apace—the opening in the parietal bone widened—and a number, both of physicians and surgeons, were invited to consult upon the case. One only imagined it to be an aneurism; many regarded it as a proper hernia, or protrusion of the brain; others, more prudent, suspended their opinions on a case so truly extraordinary. Mr. Gallois was free from every suspicion of venereal taint; but as he remembered to have had scorbutic blotches in his younger days, the physicians were glad of this apology (not knowing what else to prescribe), of prescribing antiscorbutic medicines.

“ This course of antiscorbutics, far from interrupting the growth of the tumor, seemed to produce fever, and rather to augment its growth, for its increase seemed peculiarly rapid while he took these remedies. It rose to the size of a turkey’s egg, and was painful, with this remarkable peculiarity, that a slight compression assuaged the pain. But the insensibility which followed compression was such, that he was more willing to endure the pain, than be thus relieved. This gentleman, abandoned, in the last months of his existence, to all kinds of empyrics, less weakened, perhaps, by their remedies, than dispirited by the melancholy prospect before him, fell gradually lower, in spirits and in strength, and expired on the 17th of April, 1773.

“ Mr. Louis, without disordering the tumor, cut through the integuments, skull, and dura mater, with one circular incision; and, having raised the whole, he found that the tumor, the size of a fist, grew from the surface of the dura mater; that it was of a regular circumscribed form, somewhat compressed, where it lay under the skull; more prominent, where

it rose through the circular opening ; and so far convex, as to make a corresponding depression in the surface of the brain. The lower surface of the dura mater was thickened, and its vessels enlarged, and almost varicose. The tumor had no adhesion to the opening in the cranium *."

This case, while it strengthens the preceding testimony, brings new and interesting conclusions along with it. It brings the strongest conviction home to the mind, that not only a direct blow upon the head, but any shock, will detach the dura mater, which, if the patient survive, must generally draw after it the death of the skull ; for, the internal surface of the skull is in the same critical state that the external surface was, when the integuments (under the regimen of the older surgery) were either cut away, or dressed apart from the skull, till the surgeon was gratified, and his conscience composed, by an entire exfoliation of the suspected bone. It shows, that a person of adult years, and attentive to their own feelings, can distinguish the ill consequences of the shock. In this case is marked, in a peculiar manner, the slow progress of such diseases, and the long interval of doubtful health, and indefinite feelings of something disordered, which precedes the more desperate symptoms ; and it proves, above all, a new and interesting fact in the pathology of the dura mater, viz. that, after a separation of the dura mater, when the matter is absorbed—when the surface of the membrane is healed, without being reunited—when the first symptoms have, as in this case, ceased,

* Académie de Chirurgie, tom. 5.

the membrane is disposed to form warty or fungous tumors, which, by their pressure, affect the skull.

In one of the following states and conditions, the dura mater always must be after a violent separation from the internal surface of the skull. First, Either, the bone being hurt (as generally happens in cases where it is shaken by a blow), the dura mater cannot reunite, its surface will suppurate, and the patient die, with shiverings, stupor, and palsy ; or, secondly, the dura mater may continue separate, and yet its surface heal, but with a disposition to form these fungi, which betray its unhealthy condition ; for the cranium, by pressure on its lower surface, becomes carious, part of it is absorbed, the fungus begins to protrude through a small circular opening, and the fatal sign of pulsation in the tumor is felt, which pulsation is, indeed, the motion of the brain. Then the opening enlarges, the fungus increases, the brain is, at the same time, diseased, and sometimes suppurates ; and the patient, seized with stupor,—with epilepsy,—sometimes with howlings, and the most horrible convulsions,—expires. But, thirdly, it occasionally, perhaps often, happens, that the dura mater, though completely separated, is, after an interval of danger, reunited with the skull, and by a process which at once thickens the membrane, and reunites it to the skull with peculiar firmness, the difference betwixt the attachment of the natural and lacerated portion being too palpable to be overlooked. But these are accidents which will come out in proof spontaneously. Allow me, now, to call your attention to the circumstances of this individual case ; reflect on them, and you will find, that they admit but of

one simple theory,—viz. that the dura mater was separated by the shock ;—that while the dura mater was in a state of suppuration, there was a period of danger, accompanied with confused feeling, which did not cease for four months ;—that the dura mater, though healed, was not sound ; it continued separate from the skull ; tuberculous tumors were formed on its surface ; the skull, by a slight pressure in this unnatural state, became carious, ulcerated, and was so far eroded, as to allow the tumor to protrude ;—the scalp (lying over a bone thus diseased) did not rise into that prominent, circumscribed, puffy tumor, which marks a recent injury, and which is produced by putrid air, inclosed within diseased cellular substance, but was dry, and crepitating, like rumpled paper, a phenomenon well corresponding with the presumed condition of these integuments, outwardly alive, and not much distended with swelling, but inwardly diseased, or rather dead ; and holding no connexion with the skull, merely covering a tumor, unconnected with it ; and, in short, truly that which it is in the report said only to resemble, “parchment, dead skin * !’

* This was a favourite subject with my brother ; but I must confess, I cannot yield my assent as to the cause of the mischief. In this case we have nothing particular but the connexion, too implicitly relied on, that is, the dependence of the disease upon the accident ; and it must not be forgotten, that we have the disease ascertained by dissection, where there has been no such cause alleged. In my opinion, these are cases of disease of the bone, and consequently of the dura mater, which is the internal periosteum. When we consider the very close connexion betwixt the dura mater and the skull in a boy, it appears to me very unlikely that the membrane, in that case, should be shaken from the skull, and much more probable that the narrative was inaccurate, and the bone really hurt at first.

In the German Ephemerides is to be found another case still more interesting, and farther confirming this singular fact of the separation of the dura mater by a general shock ; and of that surface which remains detached forming fungi, and destroying the skull. “ This man was about fifty-one years of age, fell from his horse, and was sensible of a violent concussion of the head ; a distressing pain ensued, but it soon vanished, and the patient thought no longer of his fall, nor of this pain. About four years after, he became conscious of a loss of memory ; and this malady increased so from day to day, that he at last forgot what he had said or done the moment before. Then came cruel and incessant fits of epilepsy. Those paroxysms seemed, for six months, to be appeased by the medicines he took ; but there followed next pains of the head, excruciating, unremitting, and continual, which no remedy could alleviate, and which, in six months more, proved fatal ; and so dreadful were these pains which affected the left side of his head, in the form of megrim, that the left eye was convulsively turned in its socket, by the excess of pain.

“ On opening the skull, the middle and fore part of the right parietal was carious, and destroyed in a space equal to the size of a half-crown. Lesser spots of caries were observed in various parts of the skull-cap, while the left parietal was corrupted by a fungous excrescence from the dura mater, which extended towards the orbit, and had destroyed also the cribiform plate of the œthmoid bone.”

Here we see again the sudden shock separating the dura mater, perhaps to a great extent from the skull.

The bone dying, and falling into general disease, by the loss of its nourishing membrane; and that fungus (which it seems the peculiar disposition of the dura mater to produce, when healed apart from the cranium), destroying the parietal bone, making its way through the thin plate of the œthmoid bone, and causing death before it had growth sufficient to produce an external tumor.

It seems to me, that every cause which separates the dura mater, and keeps it separate, whether that cause be a caries of the bone, from a blow,—a slow and spontaneous caries, from disease,—or a febrile caries, from cold,—has often the same effect with the separation of that membrane by a shock*.

“A woman, of forty-five years of age, fell upon a beam, and suffered a severe contusion in the head. The pain which followed was yet very slight, and soon vanished. A tumor the size of a filbert appeared, and continued stationary for twelve years, without trouble or pain; when, in consequence of recent bruises, the tumor grew daily, till it attained to the size of thirteen inches in diameter, and seven in height, occupying the whole of the left parietal bone, encroaching also a little upon the right, towering to such a height, as to resemble the head of a new-born child. So rapid was its growth from day to day, and the pain was so acute, that it was judged that no time should be lost in ridding this woman of her tumor; and as there was felt a deep-seated pulsation, it was judged right, for fear of hæmorrhagy, to

* “Febrile caries from cold” is not like the language of Mr. John Bell, and I confess I do not know what is meant by it. It is remarkable that he should omit the instances of venereal caries, which are of daily occurrence in our hospitals.

apply rather a ligature, and decline operating with the knife.

“ The surgeon, accordingly, put a silk cord round the tumor, which he lightened more or less daily, according to the degree of pain, until the fourteenth day, when the root of the tumor, measuring only an inch in diameter, was cut across with a knife. The mass of the tumor weighed four pounds, six ounces ; and it was now seen, that the skull was carious through both its tables, and that the pulsation was that of the brain communicated through the tumor, raising the basis of it at every stroke. In a few weeks, the patient was seized with convulsive motions of all the opposite side, and her death was immediately preceded by violent convulsive struggles, which lasted six hours.

“ On examining the head, the caries was found extremely irregular in its border, forming an opening from four to five inches in diameter, while various spiculæ, projecting from the borders of this opening, transfixed the fungus. The dura mater itself was sound and clean, without spot or blemish ; but where the fungus rose from its surface it was greatly thickened in its substance (to three times its natural thickness), and had formed inseparable adhesions with the brain and pia mater*.”

I should now call your attention to the serious and important purpose of this part of my discourse, to teach you how to form a just prognostic in these cases, and to mark the inevitable consequences of

* Academie de Chirurgie, tom. 5, p. 52. Of such specimens there are several in my Museum, and in that of the London College of Surgeons. I believe them to be diseases of the bone, into which the surrounding parts have been ultimately drawn.

such ill-judged operations ; but that I think there is one circumstance concerning the separation of the dura mater still unexplained, which it will be gratifying, and perhaps useful, for you to understand. We are at no loss, you will observe, to ascertain those effects of the separation of the dura mater, when that separation is immediately fatal, or when tumors are formed upon its surface, and the patient's sufferings protracted for years. But when, in place of proceeding to suppuration, or giving rise to tumors, the dura mater, after a slight suppuration, is reunited with the skull, and the patient restored to health, by what signs, or appearances, shall we know that the membrane has been thus separated and reunited? It may not be, in itself, a matter of essential importance to ascertain this fact, but it will give us confidence in all our other conclusions, if we can satisfy ourselves, first, that the dura mater, when separated by a blow, generally suppurates ; secondly, that when shaken by a general shock, it sometimes heals apart from the skull, and shoots out from that surface which was once connected with the skull, fungous tumors, which destroy it. Thirdly, that the slow secession of the dura mater from a corrupted bone also leaves its surface in a condition prone to the generation of fungi. And, finally, that there is reason to believe, that the dura mater which reunites so easily with the outer surface of the skull, in cases of fracture, is also often separated by shocks, or blows (which produce only slight confusion, and very transient sickness or pain), and reunites, without the slightest suspicion on the part of the surgeon that any derangement, so dangerous as the separation of the dura mater, had been produced.

“ A dragoon, about forty years of age, fell from his horse, and from that moment, during the ten years that he survived, he felt, after every slight irregularity, a burning heat in the chest, and oppression of breathing, amounting almost to suffocation. Yet he did his duty all along, as a soldier, with alacrity.

“ One day, while standing centinel, he was, without any predisposing cause, seized with his usual pain, accompanied with such oppression of breathing, that he was carried to the hospital almost suffocated; and there, after being bled, and taking a little of a pectoral syrup, he almost instantly expired.

“ On the inner surface of the cranium, where the great arteries of the dura mater make their impression, and where these furrows usually cease, there was, on each side, a large hollow, capable of containing a walnut, and each hollow was filled with a large tubercle, proceeding from the surface of the dura mater, and adhering very firmly to the bone; and it was especially remarkable, that the dura mater adhered, on the right side of the vertex, so very firmly to the inner surface of the skull, that it could not be separated without the greatest difficulty; while, on its lower surface, it adhered with equal firmness to the pia mater beneath.

“ This unnatural adhesion of the dura mater to both the pia mater and skull was plainly no other than the cicatrix of some former separation; for the lower surface of the parietal bone, corresponding with this adhesion, was irregularly callous*.”

* I confess I do not, in this case, see the train of consequences fairly deduced. These symptoms stated here are not of the class usually attendant on disease of the brain or membranes.

Be assured, that in speaking thus particularly of tumors proceeding from within the skull, I have been insensibly led on to this subject, by considering the various consequences of this separation of the dura mater ; that I have not entered into this detail, merely that I might explain the philosophy of these cases ; nor do I search the records of medicine for tales of miscarriage and imprudence, calculated to raise or to gratify a petulant temper, to stain the reputation of great men, “ To strike the monuments where noble names lie sleeping.” By those memorable anecdotes which I am now going to relate, I mean merely to acquit myself of an important duty ; to impress you with just and serious fears of entering upon any surgical enterprise where such tumors arise from within the skull. The cases which I have already detailed are not intended to adorn the works of a learned society, or to be a matter of stupid wonder, but to serve as useful warnings ; they are forms of disease, horrible indeed in their conclusion, but in their beginnings hardly to be distinguished from the most trivial tumors ; and that surgeon is in great danger who does not, from reason and reflection (for experience few can have in such rare cases), form a decided opinion the moment such a tumor is exposed, who does not resolve, with a steadiness not to be shaken, “ not to touch it for the world.” The good that can be done is problematical, the danger dreadful ; and the surgeon who but allows himself to consult upon such a case, or to hearken to the entreaties of a patient wearied of life, is in danger of robbing him of life. The disease, it must be acknowledged, is fatal in the course of nature, yet, wherever operations have been attempted, the patients

have been directly put to death by the hands of the surgeon.

“ In the year 1697, a man presented himself at the Hotel-Dieu, of forty years of age, having a firm but pulsating tumor, covering almost all the parietal region, and towering to three inches in height. He had been distracted with pains for a year ; during six months he had been blind, and was now almost deaf. Mr. Sivert, who received him, consulted with Mr. Joseph Petit ; they found it imprudent to make incision into such a tumor ; perhaps they apprehended it to be an aneurism ; and it is expressly mentioned in the narrative, that they feared lest he should bleed to death. Venesection and purging seemed but to aggravate his sufferings ; when, at last, exhausted by his torments night and day, and driven to utter despair, he besought them, he demanded, that some operation should be performed, and declared, that if they refused his entreaties, he would cleave this tumor with his knife. They complied. The apex only of the tumor was opened with a scalpel ; nothing issued but florid blood, which, in spite of compression with bandages, and the pressure of the hand, continued to flow for two days incessantly. He died on the second day.”

“ A soldier, while confined to the hospital in Strasbourg, by a swelling of the thigh and haunch, was sensible that a small lumpy tumor, seated on the forehead betwixt the eyes, was increasing rapidly, but without pain. While the surgeons applied resolving embrocations and cataplasms, it increased so as to depress the upper eyelid, and close the eyes. Mr. Le Mair, surgeon to the military hospital, a man esteemed for discretion and good sense, proposed to

the patient to have the tumor opened. He consented; a crucial incision being made, displayed a white, spongy, and fungous-like mass of flesh, quite insulated. The fingers could be turned entirely round it, and one finger could even be introduced within the cranium, till the dura mater and its pulsations were sensibly felt. Instantly after this operation, the man fell into a profound lethargy, from which he never awoke, but expired on the fifth day !

“On dissection, the frontal bone was found dissolved by the pressure of the tumor, which had also made a deep impression on the substance of the brain.”

Mr. Le Grand mentions the case of a gentleman belonging to the court of Brussels, who had venereal chancres, which had now been fairly cured. This was in the year 1758 ; and, in a little while, he perceived a swelling on the crown of the head, in the place of the sagittal suture, which was very little noticed ; it was flat, and yet was mistaken for a lumpy tumor. Its increase was by no means rapid, yet, by the year 1762, it was grown to such a size, as to fill his night-cap. Its growth was not attended with the slightest sign of redness, pain, nor any irregular symptom ; yet the base of the tumor was no less than twelve inches in circumference. Mr. Le Grand was persuaded it would be folly to meddle with such a tumor ; but the impatience of this gentleman, who could not wear his wig, nor go abroad about his necessary duties, was such, that other surgeons, contrary to the advice of Mr. Le Grand, applied a caustic to this tumor. A few days after, the patient was seized with convulsions, and on the eighth day he died. The tumor was found to be of a fungous

nature, and to have destroyed two thirds of both parietal bones.

In children, too, we have examples of the same sufferings, the same bloody and shocking catastrophe, as in the following case recorded by Mr. Choppart.

“A child being returned from nurse, of two years of age, quite lively, and without any disorder, was attacked soon after with a continued fever, but recovered. About a month after, the mother, in combing its head, observed a small tumor over the right ear, which gradually increased, till, in the course of five months, it had attained the size of a hen’s egg, but without discoloration or pain. Mr. Coutavoz was called, who carried along with him Mr. Choppart, then his pupil. Coutavoz thought fit to make an incision in the centre of the tumor; only a little black blood flowed out; the child was dressed; Mr. Choppart visited in the evening, and found the child easy, the dressing discoloured with a little flux of serous and foetid blood; but next day the child died.

“Such an event, unprecedented by pain or other symptoms, induced them to examine the head carefully. It was opened by Mr. Choppart, who found a fungous tumor of the dura mater, which had made its way through part of the parietal and temporal bones, forming within a proportioned depression in the substance of the brain.”

But of all the misadventures of this nature, that which we mention with the greatest reluctance and pain is, the authenticated impropriety of Heister’s conduct, in a case, too, where the signs of danger were least of all equivocal, when we should have expected a man of very inferior talents to form sensible and prudent resolutions.

“A Russian soldier, a big and athletic man, of thirty-four years of age, who led a dissolute life, and had often syphilitic infections, which were rather suppressed by any medicines he had taken, than entirely extinguished, was obliged, with a vitiated constitution, and under every privation of food and rest, to follow the camp through every vicissitude of air, sleeping often uncovered on the damp unwholesome ground. From these causes arose a tumor on the left side of the head, at first no bigger than a walnut, but gradually enlarging, so as to occupy the whole of the left, and part of the right parietal bone, beyond the sagittal suture. Slight as the pain of this tumor was at first, he was so alarmed as to look round for assistance; the military surgeons having tried every thing in vain for his relief, and prognosticated nothing but the most fatal issue, he came to Helmstadt, and put himself under the care of my patron, friend, and protector, Heister. Heister, with his usual solicitude, examined this tumor, found it almost immoveable, and very hard; and recollecting how often he had cured such tumors with the knife, he declared to the patient, that there was no cure but the knife, neither could he promise absolute relief, since he knew not how deep its root might lie, nor in what degree it might have affected the parts beneath the cranium, or perhaps the brain, since his senses were at times much disturbed. Yet (said the illustrious president), this is one of those cases to which the maxim of Celsus may be applied with peculiar propriety; ‘*Melius esse experire anceps remedium quam nullum.*’

“The patient, impelled by the desire of being re-

stored to health, declared himself willing to submit; and his constitution being duly prepared by medicine, a caustic of alkali and quick-lime (such as Heister often used for the opening of all varieties of tumor) was laid upon the part. Three hours had scarcely elapsed, when a profuse hæmorrhagy, apparently from cutaneous vessels, came on, but was soon suppressed by spirituous applications, so that the patient revived. In the evening of that day, the head being unbound, the plasters and compresses which had circumscribed the operation of the caustic being taken away, and the tumor opened, it was found necessary to bind it up again, on account of bleeding. The patient felt so little pain, that, emboldened by his easy state, he was guilty of the greatest imprudence. He walked two hours, in chilling weather, in a hall open to every wind (*rudibus tunc temporis ventis*), whence he was presently affected with shiverings, with lassitude, and a creeping feeling and tremulous motion in the limbs, an immediate fever, and a profuse perspiration. Next day, at the hour of dressing, when the bandages were undone, a new and inflamed swelling covered all the left side of the forehead, while a bloody ichor flowed from the original tumor. Discutient medicines were applied to the former, to the latter turpentine and *emell rosarum*. But he was past help; for, along with a continual inquietude and tossing of the body, there was a delirium which the most powerful medicines could not appease. Next day, we found our patient lying extended, with his eyes closed, his lips livid, and all the signs of approaching death. We hardly dared to raise him to have the sore dressed;

and hardly was this last office performed, when his limbs quivered, and he expired." The dissection resembles the others of fungus of the brain.

This is the awful scene in which the surgeon is involved, when he puts a rash hand to such a tumor ; this the tragical and bloody close of that scene, in which he unwarily makes himself an actor. It was not owing to the "rude winds" that this unhappy person died before his time, and in greater torments, but to an ill-founded hope, or weak compliance, on the part of this truly celebrated man, whose mistake will serve you, I trust, as a memorable warning. This lesson I have repeated in strong, and, I hope, persuasive terms. Every new disaster must seem more lamentable, every new offence against the rules of good sense and prudence more culpable. You will lament to see men of education and skill, men charged with the high responsibility of public duties ; men like Heister (men whose years and learning, whose self-respect and self-command, should forbid them from making experiments even on those who hold the remains of life by the shortest tenure), imbruing their hands in blood, and performing operations so cruel and so hopeless, as to bring only disgrace upon our science. Although the signs of this kind of danger are far from equivocal, such things have been done from time to time, and the offence is repeated, although Parée, nearly three hundred years ago, deprecated such rashness, and closed just such a narrative as that which I have just recited with these memorable words : "*J'ai bien voulu reciter cette histoire afin d'avertir le jeun chirurgien de ne faire ouverture à la tête en semblables tumeurs.*" So many fatal mistakes, so many patients directly put to

death (though really dying) by the hands of the surgeon, is sufficient to give importance, not to this description of tumor only, but to every thing which resembles it.

Let these facts, then, stand to you in place of experience. Examine, with a scrupulous and jealous precision, into the history of all tumors seated on the head. Regard as suspicious those which are connected with venereal affections, with blows, or falls, or concussions of the head. Regard as peculiarly dangerous all tumors of slow growth, of deep pulsation, receding within the cranium covered with puffy scalp, and causing, upon being repressed, not pain, but sickness, confusion of head, convulsion, and tremblings of the limbs. When the skull is first destroyed, and the brain, or the internal tumor protrudes, a temporary relief sometimes ensues. Occasional ease is sometimes procured by gentle pressure, and equable support, but the event is inevitably fatal; and frequent swoonings, insensibility, coma, or quivering of the limbs, an involuntary discharge of urine and fæces, delirium, and convulsion, close the scene. Touch no such tumor, at the peril of your reputation; for it is either a caries of the cranium, through which the brain protrudes, or an aneurism from without, or a fungus from within, which has destroyed the bone*.

* That my reader may be ignorant of none of the authorities nor precedents, and unacquainted with none of the horrid forms or symptoms of this disease, I have been at pains to translate the following cases:—

“ A healthy young woman, of eighteen years of age, fell down the steps of a cellar from the top to the bottom. She lay senseless for an hour; and, upon reviving, was astonished to find herself laid in bed, having not the slightest recollection of what had happened. The contusion of the integuments, merely over the back part of the parietal bone, was too slight to require attention; but,

Let us now return to reflect on one indisputable fact, and it is this :—Within the proper structure of the skull, the circulation is so vigorous, and its sources of blood so varied, that the bone by no means depends

during all that year, she had, from time to time, vomiting and sickness ; and for twenty-nine years after, she was afflicted with miserable pains within the head, aggravated always during the heat of summer.

“ At the end of the twenty-nine years, in going behind a loaded carriage, it being suddenly overturned, she received a blow exactly upon the spot injured twenty-nine years ago. She fainted, and lay insensible a full quarter of an hour, and they thought they could perceive at this time a dimpling of the bone. Bleeding relieved the pains of the head, and, when they returned from time to time, repeated V. S. procured a temporary relief.

“ It was about a year after, on Palm Sunday, there appeared suddenly a tumor, the size of a small hen’s egg. She was at church, but when she returned the most portentous symptoms began ; vomiting, with continual hiccup, with cold extremities, and trembling pulse, and every sign of immediate danger.

“ The surgeon of the institution would have opened the tumor, seated so expressly as this was, on the place where the patient had felt the settled pains so many years. Yet he did not choose to proceed in it without advice. Having called in Mr. Mazeux, he was by no means of the same opinion. He felt a tumor soft, but without fluctuation, and with a pulsation perceivable both to the eye and to the touch. They bled her in the ankle, and deferred till the morrow taking any decisive step, when they could have the advice of other physicians and surgeons.

“ She passed a terrible night, and still the bad symptoms continued ; she had faintings and cold sweats, so that they despaired of her life. She received the last sacrament ; and it chanced, that while the offices of religion were performing, she lay on the side opposite to the tumor ; and while she lay in this posture, the symptoms relented, the tumor itself disappeared, and with it all the forerunners of dissolution. The patient believed herself cured by miracle ; and, when the professional gentlemen met at the hour of consultation, in place of a creature on the brink of the grave, as their patient had been described to them, they found a woman in high spirits and health, quite gay ; and, upon examining the head, they found, in place of the tumor, a hollow, with manifest loss of substance in the parietal bone ; and the circle could be traced, by pressing in the sound integuments which covered the hollow, which was of the size of a half-crown.”

To prevent accidents, and defend the part, they made this woman wear a stuffed and quilted bonnet, piqued, and in which a small

on any one set of vessels for nourishment, nor even on that which seems the most essential to its health, the dura mater ! The whole of the dura mater may be separated from the internal surface of the skull, and

tin plate was sewed over the injured part. But, in spite of every precaution, the tumor appeared again from time to time, with all its dangerous train of symptoms. But posture and rest always prevented danger.

About that period, when the menses are about to cease, the patient was careful to have herself bled alternately in the arm and in the ankle every three months. Finally, at the end of the ninth year from the rising of the tumor, on the 16th of April, 1749, she was attacked with a diarrhœa, slight indeed, but which did not cease, when, about three in the morning, the headaches, vomiting, and hiccup, brought her again into extreme danger. At three in the afternoon she fainted, and lay as if dead for three hours, during which she had large involuntary evacuations of fæces. She then recovered her senses, but expired in less than an hour after, at the age of fifty-five years.

No one opened her head ; it was five years after Mr. Robin found means to procure the skull. The right parietal bone, at the place where she had received the two blows, was perforated with a hole no less than six inches in circumference. The inner table, more widely eroded, formed a rough irregular border, while the tumor corrupted the bone from within outwards and irregularly, so that, in the margins of the great hole, there was a score of lesser perforations, smaller and larger, while at other points the bony circle was transparent, and ready to burst out into holes.

My reason for inserting those cases in foot notes, my reader will easily divine ; it is as a resource in difficult consultations, and as a full display of symptoms.

CASE BY MR. MARIGUES.

“ A woman about fifty years of age, of a leuco-phlegmatic habit, had been subject, for thirty years, to violent epileptic paroxysms, which were attributed at first to a fright. Being attacked with a catarrh, she felt, in every paroxysm of coughing, a very acute pain under the upper part of the occipital bone, which made her often lay her hand upon the part, as if to give her ease. Troches, &c. cured her cough ; and it was remarkable, that while this complaint continued, she had not once suffered an epileptic attack. About a month after this, she was suddenly attacked with epilepsy while sitting. She instantly dropped from her chair, and struck the floor with her head upon that very spot where the cough was wont to excite the pain, and from that moment she was never free from suf-

yet the union be restored. We often, upon applying the trepan, perceive that the oppression of the vital powers proceeds from an effusion of blood under the skull, compressing the brain. The blood is hooked out with probes, washed away with mild injections ;

fering. About six weeks after the fall, she observed a small lump, the size of a walnut, rising on that part, and consulted a surgeon about this loup, as she imagined it. He perceived all the suspicious signs ; he was sensible both of the pulsation, synchronous with that of the wrist, and of the tumor being surrounded by the circular borders of the occipital bone, through which it projected. He pronounced it a *hernia cerebri*, and chiefly for this reason, that upon pressing the tumor it receded within the cranium, and, upon raising the finger, it rose again, the pulsation being manifest to the eye, as well as to the touch.

“It was a case too interesting to be meddled with without a consultation. Two other gentlemen visited along with him. The tumor being repressed entirely within the bony circle, a swooning came over the patient, and lasted while the pressure was continued. When the tumor was not pushed entirely within, there was nothing of this swooning ; but every time the entire reduction of the tumor was repeated, her senses forsook her, the eyes reeled, there was a ringing of the ears, her limbs became powerless, and the pulse died away ; and it was very remarkable, that the patient, in place of suffering by those experiments, was relieved of the dreadful pains in her head, the moment the tumor was pressed back from the inner surface of the bony circle.

“This relief they have attributed to the pressing back of the tumor, so as to prevent it resting against the inner surface of the ragged circle of bone. I attribute it to that natural and gentle support which the brain should have from without, and the want of which fills the head with blood, causing those convulsions and pains.

“Mr. Marigues could not believe that the bone, without any previous swelling or inflammation, could be destroyed by this blow ; nor could he believe the soft substance of the brain capable of forming so firm a tumor ; he could not therefore admit the idea of a *hernia cerebri*.

“Whatever was the nature of the tumor, certain it was, that the woman was relieved by gentle and uniform pressure ; (N. B. These are the words of the paper, and it is, indeed, a very remarkable fact) ; though a violent pressure disturbed the functions, a gentle one gave her relief.”—Vid. *Mem. de Chirurgie*, p. 26.

“The patient soon wearied of the bandage ; the pains returned, cephalagia came on, and they perceived that her memory began to fail. The tumor increased in size one third, the state of the patient

diluted by the natural secretions, and by the purulent discharge from the suppurating surfaces of the dura mater and skull; and the clotted blood being thus dissolved and discharged, the surfaces unite again. We are often persuaded, by the quantity of the extravasated blood, that it must have covered the whole hemisphere of the brain, up to the sagittal suture. We sometimes feel the extent of the separation, by introducing the probe; but we seldom have so clear a conviction, as in the following case of the whole

was very afflicting; any bright light, or luminous object, excited the most extreme pain. The examination of the tumor being renewed, there was now no difference of opinion among the consultants; all agreed that the tumor was of a schirrous and fungous nature, and that its roots lay within the skull; and they said the only chance of relief was to make a crucial incision in the integuments, and apply two or three crowns of the trepan round the opening of the bone to enlarge it, and treat the fungus according to its nature. But this was an operation to which the patient would not consent.

“A few days after this consultation, she complained first of a pain in her right arm, and then it became powerless; next, the lower extremities were seized first with pain, and then with paralysis. The pains of the head required that bleedings and anodynes should be again administered. She lived on till October, when her friends gave her entirely into the hands of the physicians, who applied various cataplasms and fomentations, blisters under the knees, and cephalic tinctures to the nostrils. These were almost as certain signs of approaching death as the symptoms themselves. She died on the 23d of October, about seven months after the commencement of that catarrh, with which the more desperate symptoms began.

“On opening the head next day, the integuments and pericranium were sound, and without the smallest adhesion to the tumor: which want of adhesion is another consequence of this disorganising pressure. The tumor was of a fungous substance, and seemed to be generated in the substance of the dura mater; its base was broader than its projecting part, whence it was in some degree strangled by the embracing of the bony circle. The opening in the skull, of an oval form, was hardly an inch and a half in its short diameter, or two inches in its longest. The roughness along the line of the longitudinal sinus, under the sagittal suture, proved that there the dura mater had become unnaturally vascular, and had begun to assume the disposition to disease. The inward projection of the tumor was lodged in a hollow of the left hemisphere of the brain.”

extent of the dura mater,—of the whole internal periosteum of the skull being detached. “A young man, of about thirty years of age, was struck repeatedly on the head with a crab-stick, and with a loaded whip. Next morning, he was found lying in a state of profound lethargy, and with his right side paralysed, but without the slightest appearance of fracture, or depression of the skull. The marks of the blows being chiefly on the right side, that side (contrary to a well established rule) was first trepanned, and the dura mater was found disengaged to such an extent, as to contain, at least, six or seven ounces of blood, betwixt it and the skull.

“This first perforation gave him some respite, but his friends resisted all further attempts to relieve him, till four days had elapsed, when there appeared no longer any hopes of life, and he was left to die among the surgeon’s hands. Then the left parietal bone was trepanned. The whole hemisphere of the brain was seen to be surprisingly compressed by a thick black cake of coagulated blood, of the consistence and colour of currant jelly. The cake of blood extended actually from the falx, or sagittal suture, to the bottom of the os petrosum; in short, from the vertex to the base of the skull; and seemed to consist of the same quantity that was discharged from the other side, amounting, of course, to six or seven ounces of blood. Although it was not thought prudent to bring away at once the whole mass, yet, so much was discharged, that, upon speaking to the patient, he instantly looked up, like one awakened from sleep, named every one, and raised the arm which had been paralytic over his head; and much of the coagulum being removed, he recovered apace,

so as to be able, by the fifteenth, to walk into an adjoining room; but by the accidental bursting out of an artery in the scalp, he was weakened; the confusion of head, and even the paralysis, in some degree returned.

“Some days after this, his friends, despairing of his life, laid him on a litter, and, without acquainting his surgeons (Mr. Hill, and Dr. Gilchrist, of Dumfries), carried him home, a journey of eight miles. The left side of the brain suppurated five or six times, each paroxysm of inflammation being accompanied with fever, stupor, and difficult deglutition, and relieved by an eruption of matter; and it was remarked, that when such suppuration formed towards the fore part of the brain, the candle appeared to the patient double; but when the suppuration was backwards, the light appeared to have a halos, or circle, round it; and after each eruption of matter, the candle appeared single and distinct. Notwithstanding these occasional interruptions, he was, in three months, completely cured; became the father of a family, and lived long in perfect health, excepting a slight defect of memory, and slight convulsive twitches, to which he continued subject.”

In this most interesting case, related by Mr. Hill, he had taken every pains to ascertain the extent of the separation. He found no apology for introducing his probe under the skull, on the right side, because the blood flowed freely out; but, on the left side, his probe, while hooking out the coagulated blood, passed from the trepan hole, in the centre of the parietal, downwards, along the temporal bone, till it was stopped by the curvature of the os petrosum, and upwards again by the lambdoidal suture, all along

the sagittal suture, and over the orbit, along the frontal bone ; and it is my persuasion, says Mr. Hill, that the separation of the dura mater was not less extensive over the right side.

What, then, are we to infer from these phenomena? Surely this :—That, as lacerated scalp adheres readily with the external surface, the dura mater has an equal aptitude to re-unite with the internal surface of the skull ; and these phenomena present themselves daily to the observation of the practical surgeon. He presumes, from the sudden oppression of his patient's senses, and the palsy of his limbs, that the dura mater is separated, by a shock, or blow, not slightly, so as merely to endanger suppuration, but to such extent as to cause a great effusion of blood from all its vessels. He trepans the skull, and by the general pressure, and rising of the brain, the blood is, as I have generally observed it, spued up in grumous clots, through the trepan-hole. He puts in his finger,—turns it round,—feels no solid resistance, and is conscious that the dura mater is much depressed, and the effusion of great extent. Sometimes he finds a cake of solid and firm coagulum, which bears the pressure of the finger. At each dressing, he introduces his probe, bends it, and turns it in every direction ; by injections of tepid water,—by the help of the probe,—by the purulent secretion from the surface of the skull, and dura mater, the blood is gradually discharged, and by every mark it is certain, that the extravasation has exuded under the whole of one parietal bone, from the forehead to the occiput, and sometimes from ear to ear. Yet, by the secretion of pus, and by the heaving of the brain,

the blood is entirely discharged, and purged away. The skull and dura mater are in a state of suppuration by the time they are allowed to approach each other. The dura mater is covered with a velvet-like pile of granulation. The margins of the trepan hole, and (by inference) the internal surface of the skull, are covered with a similar pile of granulating flesh. The dura mater is, by the pressure of the brain, supported in close contact with the skull, and the surfaces are united, and the trepan hole closed by a process of nature, visible to the surgeon, in every stage, and expressly resembling the re-union of soft parts.

Thus, we are sensible, by daily proofs, that the dura mater, which sometimes is slightly separated, and insensibly re-united (the blood effused betwixt the bone and the membrane becoming animalised), which sometimes, after such separation, heals apace, and forms fungi; which most frequently of all suppurates, and affects the brain; has yet in all cases a tendency to re-unite with the skull, so marked and particular, that wherever it does suppurate, and prove fatal, it is from one of these two causes:—either, the effusion of blood is of such extent, as to hinder the re-union by its interposition, as a foreign body, and to oppress the brain by its pressure; or, the bone itself has received some irreparable injury, has its internal organization deranged by the blow, is no longer alive, nor capable of maintaining its union with living parts.

[My brother, in this chapter, speaks so confidently of the reunion of the dura mater to the bone, and the recovery of the patient after a coagulum has been

thrown out under the bone, that I feel it justice to the young surgeon to say, that while this union does sometimes take place, and therefore the reasoning in the text is perfectly correct ; yet he must not be sanguine in these cases ; he must be prepared for disappointment, when the shock to the head has been so violent as to separate the dura mater, and throw out a large coagulum of blood betwixt the bone and membrane. And the reason is very plain ; when the violence has been so great as to shake the dura mater from the brain, is it possible that the delicate texture of the brain can have escaped injury ? Accordingly the patient dies, not because the membrane is separated and the blood extravasated, but because the brain has been injured at the same time, so that it inflames.

On looking back to the subject of this chapter, while nobody can deny the ingenuity of the reasoning and the very great importance of the facts brought forward, I am bound to express my opinion. I cannot deny, that, by such injuries as are here described, the dura mater may be separated ; and, consequent on such injuries, fungus may grow from the membrane. But from extensive opportunities, I am borne out in saying, that I have seldom seen those fungous tumors of the dura mater arise from injuries, excepting where there is a scrofulous or venereal taint in the habit.]

OF CONTUSIO CRANII.

In contusions of the tibia, or ulna, the pain, the fever, the profuse suppuration, may exhaust the patient ; but it is only when the contused bone is

destined to defend viscera essential to life that life is endangered.

“ A trooper (says Petit) was struck by a pistol-ball, which grazed the middle of the sternum obliquely,—made a small wound,—laid bare the outer table of the bone, without depressing it; and the ball, being thus turned aside, did not penetrate, but passed out, and was found in the breast of his shirt. So little was he sensible of the injury, that after having a compress, dipped in spirits, applied to the wound, he mounted again, and rode into the field, where the battle lasted an hour. Upon his return to the camp, his surgeon, though he agreed with him that the wound was slight, assured him that it must be dilated, and the bone laid bare. He said, he knew they could cure him by compresses soaked in *arquabuse* water; ye the submitted to confinement, and a severe diet, and to the being bled in the arm. Till the fifth day, he was highly pleased with his own wise councils, but he began then to feel a slight difficulty of breathing, and a heavy pain in all the fore part of the thorax. The hurt part became red, and tumid in all its circumference, and black in the centre. Then he consented willingly to their doing with him whatever they pleased. A large crucial incision was made upon the part. He was repeatedly bled; the pains ceased, the suppuration became healthy. The bone exfoliated, though it required a long while, and he was then cured *.”

The blow, which in this case had not depressed the outer table, had yet contused the bone, since the ball could not be thus turned aside without the bone

* Petit.

receiving obliquely the force of the ball. This trooper began to feel that oppression which in such cases precedes the suppuration beneath the sternum, proceeding like that beneath the cranium, from the death of the skull. He was rescued from the imminent danger of death and suffocation*; and this contusion of the bone, which brings oppression and difficulty of breathing, when the sternum is injured,

* That my reader may understand this kind of danger, that he may know the manner an abscess forms under the sternum, in consequence of such contusion of the bone, I have transcribed the following case from Petit : “ Un soldat eut une pareille plaie qui parut légère à son chirurgien. Il ne daigna pas y faire une incision ; il se contenta de la panser avec le digestif, il ne paroissoit point d'accidens ; il ne saigna son blessé qu'une fois ou deux, et le laissa maître de son régime ; la plaie suppura. Cependant les chairs couvrirent l'os, et semblerent se disposer à la cicatrice. Le blessé quitta son hôpital, et retourna à sa troupe, où peu de jours après il tomba malade d'une fièvre, qu'on attribua à son mauvais régime. On combattit cette fièvre pendant quelques jours sans faire attention à sa plaie, qui effectivement à la voir, paroissoit n'avoir aucune part à la fièvre : on l'envoya à l'hôpital de Mons, où j'étois alors ; il me raconta tout ce que je viens de dire : j'examinai sa plaie ; j'y portai la sonde, et je trouvai l'os découvert : la fièvre étoit médiocre, mais il avoit dans la journée plusieurs frissons irréguliers. Depuis quelques jours, il sentoit une pesanteur sur la poitrine ; quand il buvoit il perdoit haleine, ne pouvoit tousser sans douleur, et, après la toux, il étoit quelque temps à aller ; comme quand on a fait une longue course. Je soupçonnai quelque suppuration sous le sternum, ou dans le diploë de cet os. J'avertis M. Renault, alors chirurgien-major du dit hôpital ; il pensa comme moi, il conclut qu'on découvreroit l'os et qu'on appliqueroit le trépan exfoliatif ; ce qui fut fait : il en sortit quelques matières sanieuses ; et quoiqu'on eut détruit tout le tissu spongieux jusqu'à la table, interne on ne crut pas avoir pénétré jusqu'au foyer qu'on soupçonna alors être au delà de l'os dans la duplication du médiastin. Pour s'en assurer, on appliqua le perforatif, et, ayant percé l'os, il sortit du pus ; mais l'ouverture n'étant pas suffisante, on y appliqua une couronne de trépan avec beaucoup de précaution ; il sortit un demi verre de pus ; le malade sentit soulagé : enfin les pansemens réguliers et le régime le conduisirent à une parfaite guérison en moins d'un mois, et sans exfoliation : il n'y a pas lieu de douter que le malade fut si on ne lui avoit pas fait cette opération.

brings delirium, coma, and convulsion, in a similar injury of the skull.

There can be no more sure and unexceptionable proof of contusion of the skull, than that which happens from the grazing of a ball. A musket-ball communicates no heavy shock by which the dura mater may be shaken, but is the most destructive blow to the bone, which being struck obliquely, turns the ball aside, and receives its whole force, has its internal structure, or living powers deranged, or injured, and blackens soon, and exfoliates slowly, and sometimes terminates in a mere caries, but much oftener in a fatal suppuration of the dura mater and brain. I need not seek to impose upon you the authority of respected names, to confirm a theory which, before I conclude, shall be variously and incontestably proved; but remark it rather as a proof of the ingenuity and good sense of Botallus, that he understood so well the invariable effect of a ball, in deadening the bone. He regards every gunshot wound of the head (that where there is merely a bruise, as well as that where there is a fracture), as an accident requiring the trepan. He represents the slightest touch of a ball as a kind of contusion, never to be neglected. He directs, that the piece so struck should be cut out with the trepan. He says, finally, that having seen some die, from such slight grazing of a ball neglected, he has, invariably, found pus collected under the dura mater, directly under the injured part of the skull. “*Aliquos etiam sola levis-sima illusione a globulo facta tum in fronte tum in aliis capitis partibus, præ negligentia tam patientium tam artificum interiesse vidimus; quibus omnibus,*

recta ad os ictum pus collectum reperiebatur sub membranis *.”

The soldier who is struck obliquely by a musket ball whirls round, and falls. He lies as in a swoon. When he revives, he is cold, pale, with a haggard countenance, and wild and confused air; but he is soon able to get upon his feet. He is carried to a safe place; there is found no external wound; the integuments are livid, yet no inexperienced person would apprehend any danger; but he continues pale, dispirited, and languid; in a few days, the part is puffed up, and slightly swelled. He has then sickness, swimming in the head, cold, shivering, and nervous tremors; and, upon making incision into the part, the bone is found bare, and often discoloured; and if, upon the exacerbation of these symptoms, the trepan is applied, pus issues through the trepan hole, and the patient is thus saved. “In the year

* Though I am not sure that Belloste understood perfectly what I have called the contusion of the cranium, yet it is very plain, that he understood well the consequences, and how to treat the disorder.

“A soldier of the regiment of Guatinois had a wound on the right side of his head with a pretty large bullet, which, grazing upon the most convex part of the bone of the sinciput, had only carried away the common integuments, not hurting the skull; but the membrane that invested it was so bruised, that it appeared livid. I know, if time had been given, it would have come to suppuration, whereupon the alteration and exfoliation of the bone must needs have ensued; to prevent which I tore off with my nails the pericranium, so far as it was bruised, which was something more than the bigness of a shilling; and forthwith I struck the uncovered bone as nimbly as I could with the pyramid of the trepan (i. e. he drilled holes in it, with the piercer of the trepan), and then covered it with some lint, wet with spirits of wine. After two days, I took off the dressings, and found the bone covered with a lively red,” &c. p. 85.—“In seven days, the bone was quite hidden with new flesh,” &c. p. 86. A similar case, in which Belloste drilled with the piercer where the bone was laid bare merely by a sabre cut, and with the best effects, Vid. p. 87.

1634, at the siege of Ratisbon," says Freitag, "a young nobleman from Hall in Saxony, serving as a cadet under Col. Bar, was wounded in the top of the head, at the junction of the lambdoidal and sagittal sutures, with a musket ball, which was found in his hat, and had made a slight wound, which his surgeon, contrary to all good rules of surgery, treated very lightly. Fortunately for this young gentleman, his surgeon died of the plague, and he fell into better hands; the ulcer was now broad, the lips tumid and callous, and the bone black to the centre, and completely carious. His present attendant, Scholtze, a skilful and diligent surgeon, was at great pains to destroy those swelled and callous edges, to enlarge the whole wound, and keep the bone dry, and clear of sanies: but the blackness of the bone yielding neither to instruments nor medicines, and seeing that a fleshy excrescence begun to protrude through the sutures, he advised that I should be called into consultation; and the patient's habit being prepared, and no milder method presenting itself to my imagination, I advised that the cranium should be touched from point to point with a broad cauterizing iron; by the help of which, aided by the natural powers, I hoped the bone might be loosened. It was in July he was wounded; in May following, the cauteries were applied. The fragment of bone first loosened, weighed an ounce and a half, others smaller weighed four or five drams. The smaller exfoliations, which were separated from day to day, amounted to eighty-two in number, and weighed in all a quarter of a pound. A fleshy substance sprung up from the diploe, and surrounding bone, to close the wound,

and defend the brain ; and in August he returned to Saxony hale and well, to the amazement of his friends*.”

The danger to which this young nobleman had been exposed is in itself manifest ; “ Almost all the great authorities are in favour of trepanning in gunshot wounds of the head, even when there is no fracture ; and, indeed, experience seems to warrant the rule †.” The danger of pus collected under a con-

* “ P. P. anno 1634, mens. Julio in obsidione Ratisbonensi juvenis nobilis ex Halinis Saxonis sub Colonello de Barr, ex bombardâ mosqueta globo plumbeo tactus in vertice, ubi sutura sagittalis cum lambdoide concurret, et concentratur, globus mansit sub pileo, et primo intuitu reliquit leve vulnus in pericranio, quod negligentius, contra Hippocratis cautelas, a chirurgo per aliquot septimanas tractatum, donec chirurgus peste extinctus, sub autumnisinem, decursu vitæ lampada alii traderet, qui vulnus in ulcus sordidum degeneratum, cum labiis prætumidis et duris, nec non ossis nigredinem alte et fixe inhærentem vidit. Hic chirurgus Dominus Jacob Scholtz, nulli parcens labori neque studio, omni nisu allaboravit, quo modo labia prædura et tumida tolleret, vulnus manifestius redderet, os exsiccaret, saniemque copiosissimam absumeret. Verum cum ossis nigredo neque medicamentis, neque instrumentis posset tolli, et caro suppullulans per suturas animadverteretur, in consilium et me adhibuit, ubi rebus omnibus præmeditatis, et corpore prædisposito, nullum tutius occurrebat remedium, quam ut latiori candenti serro per intervalla cranium nigrum cauterisaretur, et successive os occipitis mollius redderetur, nec non beneficio sagacis naturæ, quæ sæpius prævertit medicum, solveretur.

“ Hoc mense Maji factum, ubi natura maximum os ponderis lotonum trium vel unicæ unius semis, protrudebat, paulo post sequebatur minus drachmarum quinque ; minima ossa, numero 83, indies exercebantur, usque ad mensem Augusti, ubi sartus tectus, Dei gratia, patrios repetebat Lates, cum omnium stupore. Particulæ ossium fuere flumero 85, pondere fere quadrantis libræ, ut in schemate transmisso apparet. Pro propugnaculo, et occipitis firmamento, provida natura carneam massam supraduxit, quæ exorta est ex Hippocrat. διπλοῦν, quam ipse describit l. de vuln. cap. Spongiæ similem, et os ipsum in se carunculas multas, humiditas habere affirmat his obtentis.”

† “ Presque tous les grands praticiens prétendent qu'on doit toujours trépaner dans les plaies de tête faites par armes à feu, quoique le crâne ne soit pas fracturé ; l'expérience semble en effet confirmer entièrement leur opinion.”

tused cranium will be seen in the case of the soldier-lad Bennet, which I am just going to relate to you, though I think it right first to state to you, in a few words, one exception from the general rule.

“ A soldier was hit by a musket-ball on the right parietal bone. He was neither knocked down, nor apparently injured. Mr. De La Combe, who first saw the patient, found the bone bare, but unhurt, and thought he might safely defer applying the trepan. By the twentieth day he found the bone changing colour, and imagined that the increasing blackness indicated an approaching exfoliation, a scaling off the diseased surface ; but was not a little surprised when, on the thirty-fifth day, a piece of bone, of the whole substance of the cranium, separated, and gave issue to half a glass-full of pure pus, which had formed betwixt the skull and dura mater. The patient was dressed like one who had been trepanned ; the dura mater soon cleansed itself, and the opening was quickly filled up, and his cure was accomplished in two months *.” The danger of such contusion is manifest ; the duty of the surgeon is direct and plain. Seldom are we to look for such an interposition ; very rarely does the cranium thus give

* “ Un soldat reçut un coup de fusil, qui lui fit une plaie sur le pariétal droit ; ce coup ne renversa point le blessé, et ne fut suivi d'aucun accident. M. De La Combe, qui visita la plaie, trouva l'os découvert, mais il n'y remarqua aucune lésion ; il crut qu'on pouvoit se dispenser de trépaner ce blessé. Le vingtième jour il aperçut que l'os devenoit noir, il regarda ce changement comme préparation à l'exfoliation ; mais vers le trente-cinquième il fut surpris de celle qui se fit, car ce fut une pièce d'os de toute l'épaisseur du crâne qui se détacha, et qui procura une issue à environ un demi-verre de pus assez louable, qui étoit placé entre le crâne et la dure-mère. M. De La Combe traita le blessé comme s'il eût été trépané. La dure-mère se détergea en peu de jours ; l'ouverture du crâne se remplit assez promptement, et la cure fut terminée en deux mois.”

way, and so yield to the bursting of an abscess in the skull, as to an abscess in any other part of the body. I have delivered the case of one who escaped by miracle, and I shall now relate the case of one lost by delay.

“A soldier lad, of the name of Bennet, was, on the fourth of June, the King’s birth-day, shot with a pistol charged only with powder and wadding, and pointed directly at his forehead; the boy who wounded him standing close by him, and firing in a manner over his arm. The wadding hit him on the upper part of the temple, where the parietal joins with the frontal bone. The wound was slight; and so little was he suspicious of his real condition, that he walked about, unconscious of any serious injury, till the eighth day.

“When he came under our care on the twelfth of the month, he had a superficial but sloughy wound; he still walked about, though in a sickly and languid state; he had slight vertigo, loathing of food, tremblings of the limbs, nausea, and occasional rigours. He felt, for the four ensuing days, the benefit of slight evacuations, severe diet, rest, and opiates. This interval served as a test of his real condition; such complaints might proceed from wound of the scalp, or from an affection of the brain; and we were not without hopes of his being safe, since the pains of his head abated, and the vertigo, sickness, and rigours, almost vanished.

“But, on the seventeenth, his situation attracted our particular notice. He had, on that morning, a fit of rigour so long and violent, that it denoted a formed abscess within the head. On the ensuing days, he vomited the physic that was ordered for him,

loathed his food, had a perpetual nausea, with frequent and violent rigours, restless nights, and fearful dreams. But his intellect was unimpaired ; he liked to sit upon the side of his bed, and do all the little offices about his own person ; yet I thought I could observe him going round his bed, and doing many things without any decided intention ; lifting his clothes or little moveables, and laying them down again, and altogether in a state of confusion ; though, when seated on his bed, he talked rationally, and gave a clear succinct account of the riots of the day in which he was wounded.

“ The dangerous symptoms insensibly and slowly increased till the 19th. His skin was hot, his tongue parched, his pulse 112, quick, and moderately strong ; his eye languid, and his countenance dejected ; his feebleness was every moment increasing ; his knees trembled under him ; the pains of his head were intolerable, and he now could not endure the light. The previous signs of approaching danger, and his present weakness, and, most of all, the state of the bone, which was black and carious, called for our immediate interposition ; to me, indeed, it appeared, that the operation had been too long delayed, that it was now too late to save his life. After a restless and perturbed night, he submitted to the operation on the twenty-first, the seventeenth day from that of the injury.

“ The scalp was laid freely open, so as to expose a great extent of black and carious bone, eroded and perforated through its outer table with many holes. In the centre of this contused bone, the trepan was applied upon the corner of the parietal, where it is joined to the os frontis by the coronal suture, which

was in part included in the circle. When the bone was perforated, in most of the circle thick and mature pus issued through the trepan hole; and when the piece was entirely removed, and his head laid again upon the pillow, it flowed in great profusion."

This is a period of the case, in which it cannot be wrong to stop, and reflect a moment on the useful lessons it is calculated to impress. We have traced a superficial injury, with slight and apparently unimportant symptoms, to the moment of a most necessary but unsuccessful operation; for, little as his intellect was affected, this abscess had been penetrating deep into the very substance of the brain; and in a few days he expired. We cannot but be struck with all the phenomena of contusion, and take an interest in them, for they are far from being rare; and especially, we must be struck with the apparent slightness of the injury, a superficial wound, unattended, during many days, with either pain or sickness, or any sign of danger. We cannot but reflect seriously on the critical condition of such a patient; the slight variations which mark the change from health to the most dangerous condition; and above all, on the limited period in which it is permitted us to interpose successfully; how precious the moments of reflection and consultation should appear; how vigilantly the surgeon should watch over his patient, and mark those changes of the countenance, that expression of the eye, that mixed state of irritation and languor, those alternations of delirium and reason, those perturbed nights and alarming dreams, which no nurse nor hired attendant is qualified to report: and it is worthy of notice, that the matter of a suppurated *dura mater* is peculiarly ripe, *i. e.* yellow, viscid, and

tenacious (which is to be ascribed, not to the peculiar nature of those surfaces, but to the compressed state of those parts, and the continual absorption of the humid fluids), from the moment in which such abscess is begun. And let us not forget, that it is but the uncertainty of the signs that suspends our resolutions, for this is an abscess which cannot, like any other, burst outwardly; which, when once begun, penetrates rapidly to the brain, the most susceptible and the most important organ; so that there is but a moment in which the patient can be saved.

To watch the patient, and distinguish the signs, so as to interpose with decision, void of rashness, and seize the short interval that is allowed us, is the mark of professional skill. Have we not reason to believe, that we might have saved this young man's life, by interposing early? or that a compliance with that precious maxim just now recorded, "of looking upon every gun-shot wound as a case of contusion," i. e. as a case where the life of the cranium is destroyed, might have prevented the danger?

But to return to our patient: "The night following the operation, he was restless and agitated, but without delirium; and half an ounce of purulent matter flowed upon the pillow. He was quiet towards morning, and had less of the vertigo, sickness, or pain. This was but a deceitful interval. It was obvious, from the profusion of matter, that the ulcer had penetrated to the brain; the symptoms also proclaimed it; and no declaration of an academy of surgery, about the unimportance of such abscess of the brain, no narrative of hair-breadth escapes, will incline a surgeon at all acquainted with practice to look, in such circumstances, for any thing but death. Before

the afternoon he had convulsions, but with his intellect still unaffected. During the night of the twenty-fourth, he was delirious; and, on the morning of the twenty-fifth, was found paralytic of the right side; during the night of the twenty-sixth, his urine and fæces flowed continually and unconsciously; on the twenty-seventh, he lost his speech, and had still frequent stools. Though he spoke a few words on the twenty-seventh, he became gradually weaker. The free flow of the matter from within was prevented by a partial protrusion of the brain; and, on the evening of the twenty-eighth of June, he expired.

DISSECTION.

“ The bone, for a considerable space round the perforation made by the head of the trephine, was apparently dead, and its outer table, with small holes, very numerous and irregular. The adhesion of the dura mater was every where perfect, except for a very small space round the trepan-hole. The dura mater itself had a dusky brown appearance. There was no abscess on its internal surface, but many small perforations, and one larger central one; and on the surface of this hemisphere of the brain, immediately under these perforations, there were many smaller ulcerations, which did not penetrate, and one great and central ulceration, which led to a deep abscess in the centre of the brain, directly under the perforation. The edges of all the ulcerations were green and livid; the edges of the abscess particularly dark coloured; the rest of the brain seemed sound, or rather was peculiarly firm, as if from general inflammation.”

With this history before you, and holding in your mind the principles I have already explained, my comments will, I hope, be hardly needful ; no dissection, perhaps, can exhibit a more decisive picture of the effects of contusion. The external wound was slight, and there was not time for any laceration of the scalp to produce caries. There was no general shock, by which the dura mater could be separated from the skull. The explosion so near his head, and the wadding so directly hitting the skull, had so injured its vital powers, that from the moment of receiving the shock, it was dead to a considerable extent. In but a few days it was black and carious. The dura mater under it was inflamed, though not separated. The surface of the brain was ulcerated, and in its centre, under the diseased bone, was formed an abscess.

You are now, gentlemen, aware of the various aspects which this kind of caries may assume, sometimes appearing a superficial exfoliation, sometimes a deeper caries, affecting the whole substance of the bone, sometimes, though rarely, the dead part bursting and separating from the living bone ; and too often is this contusion, or death of the bone, followed by fatal suppuration within the substance of the brain. But as yet I have related no fact, nor advanced any thing, which might lead you to conceive the notion of an injury affecting a part only of the system of a bone, of a caries of one only of the tables, and of an abscess of the diploe which lies betwixt them. It was what I myself never suspected ; so that the occasion in which I first observed it was extremely interesting.

“ A young man, in the prime of life and health, fell from his cart, and the wheel, passing obliquely over his head, slid upon his skull as upon a stone. The integuments were torn down to a great extent. There were three large and triangular flaps of scalp so ingrained with mud and sand, that the blood, hair, integuments, and skull, seemed baked into one mass of filth. The man was profoundly drunk ; upon cleaning the flaps of the scalp, with the design of replacing them, the marks of the cart-wheel upon the skull, which was rough and scratched, were so visible, as to preclude all rational hopes of reunion ; yet the flaps were nicely cleaned, replaced, and held together with slight stitches.

“ That integuments so lacerated, and a skull so plainly injured, should recover, was not to be looked for ; but the injured bone might exfoliate, as a mere caries, and the violence, besides, was of a peculiar kind ; there was no fracture ; the patient had received no blow, by which the bone might be contused throughout ; the injury was apparent on the surface only, and was probably limited to the external table of the skull. The external table might exfoliate, but it was infinitely more probable that the caries should penetrate and affect the dura mater ; and it was our duty to watch for signs of danger, and yet to trust to nature so long as the injury seemed local, so long as it was possible that it might exfoliate superficially, and as a mere caries.

“ The man, more astonished than hurt, was no sooner restored from his brutal state of intoxication, than he appeared to be in perfect health ; there were no shiverings, no fever, no confusion of head during the day, nor delirium during the night ; much as we

were persuaded of his danger, it was only danger to be apprehended, no symptom as yet announced it. The suppuration from the integuments in such a case is profuse and foul, and while such a lacerated wound, so ingrained with filth, is cleansing and granulating, it visibly mends, and the surgeon is too apt to indulge hopes, which are never to be realised. In this case, the integuments first thickened, as they always do, by inflammation; were next wasted by suppuration, and remaining still insulated, the edges became livid, and sloughed off, while the skull blackened more extensively; a slight fever was inseparable from such a state; his face was full, and his eye heavy and languid; yet that was not much to alarm us; but he sickened; on the thirteenth, he was reported delirious during the night. We could no longer be responsible for delay, and he was trepanned; and circumstances of the most singular nature, which I wrote down (as always I have done by the bed-side of my patient), persuaded me, on the instant, that this was as truly an abscess in the substance, in the cancellated part of the bone, as even a boil was an abscess of the cellular substance of the skin."

REMARKS IN THE TIME OF OPERATION, AND AFTER IT.

"The integuments, by retraction, by suppuration, and, most of all, by the gangrene or sloughing of the edges and angles of the several flaps, were so wasted, as to have left an extent of naked bone, as broad almost as the palm of the hand. The bone, dry and scabrous, was black in two places. The perforation was made near the centre of the parietal bone, on a point of bone black as a coal. In perforating the

outer table of the skull, not the slightest tint of blood appeared ; it seemed dry through all its substance ; the saw-dust was black at first, and became white in the progress of sawing, and as dry as hair-powder ; it was easily blown away, and the working of the saw was like the cutting of button-moulds from a piece of horn. The whole skull was extremely thick ; the sawing, which was deliberately performed, was, of course, extremely slow ; at last, thick and viscid pus spouted up round the instrument, and I had no doubt (although I had before affirmed the dura mater and brain to be still unaffected), that there was an abscess, that the operation was fortunate, and might eventually save the patient's life. But the most accurate probing of the circle with the point of a quill did not discover to us even a single point in which the perforation was complete. The inner table, to our utter amazement, was perfectly entire ; and there appeared, for a moment, no other rational explanation of this phenomenon, than that the inner table must have been fractured, permitting the pus to exude through some oblique passage, from an abscess of the dura mater, to the cancelli betwixt the tables of the skull.

“ The crown of the trepan was again applied, and, under the impression of there being an abscess betwixt the skull and dura mater, it was turned boldly and freely, without fear of wounding that membrane, when suddenly there issued through the trepan-hole much blood, and it was feared that some ill accident had happened, in short, that the dura mater was wounded. But, upon probing with the quill, the inner table was found still entire ; there was every reason for sawing slowly and cautiously ; and it was,

accordingly, very long of being cut through. During all this stage of the operation, the blood flowed profusely ; and, when the circle of bone was at last taken out, the blood and matter ceased to flow. The dura mater was seen white and clean, firmly attached to the edges of the bony circle, and nowhere suppurated ; and every circumstance of the operation inclined me to examine the trepanned circle with particular accuracy.

“ The circle of bone sawed out with the trephine was, except one, the thickest I had ever seen. The external surface was perfectly black ; the hole where the centre tooth of the trepan pierced this carious table, and all the sides of the same table, were of a dead white or ash colour ; the cancelli were gaping and irregular, yet without any very particular appearance. But the inner table was red in its substance, and bloody in its edges.

“ The state of the dura mater was, during the cure, the subject of my most careful investigation. There was, I am well assured, no abscess ; its surface changed, and it went through the process of granulating without more matter than that which that process implies, and such as the exposed surface alone might produce. These descriptions, taken carefully from my case-book, require no comment. This, at least, is sure, that the inner table may remain sound, and full of blood, while the external table and cancelli are contused and dead ; and I have no doubt that this man was saved from most imminent danger. Every such caries should be trepanned ; very slight, indeed, is the chance of such an injury being partial at the first, or continuing so ; still less likely is it, that after penetrating just to the dura mater, it should

be separated, as in a case I have formerly related to you, by an effort of nature."

But of all the examples of *contusio cranii*, that produced by the grazing of an oblique ball, or the obtuse blow of a ball, whose force is spent, seems to me the most simple ; no other kind of violence so effectually deadens a bone, nor so certainly draws after it fatal consequences. " A Lieutenant of the regiment of Haynault," says Mr. Martiniere, " was wounded with a spent ball a little above the right frontal sinus. The surgeon who first saw him thought it right to make a crucial incision, to display the state of the bone, which he found free from fracture or fissure. The ball had somewhat stunned the patient, but bleeding had relieved this symptom ; and there seemed to be nothing to do but take care of the wound. But, at the end of three weeks, the patient fell into a lethargy, with a hard and oppressed pulse. When Mess. Petit and Martiniere were called, they found his case desperate ; yet they felt it to be their duty to apply the trepan. The perforation gave vent to a great profusion of pus ; but, by being late performed, it was of no avail *."

* " Un Lieutenant du regiment de Haynault fut blessé par une balle morte, qui lui fit une playe un peu audessus du sinus frontal droit. Le chirurgien qui le vit d'abord, jugea à propos d'y faire une incision cruciale pour examiner l'os ; il ne trouva point de fracture ; le coup avoit un peu étourdi le blessé ; mais les saignées dissipèrent cet accident ; on s'en tint par conséquent à la cure de la playe. Au bout de trois semaines le malade tomba dans un assoupissement léthargique ; son pouls devint enfoncé et dur. M. Petit le fils et M. de la Martiniere, chirurgiens-majors de l'armée, y furent mandés ; ils trouverent le malade sans espérance ; cependant l'opération du trépan leur parut indiquée de façon qu'il se crurent obligés d'y avoir recours. Cette opération donna issue à beaucoup de pus qui se trouva sous le crâne ; mais parce qu'elle ne fut faite qu'à la dernière extrémité, elle fut inutile au blessé. Ces ex-

[This I believe to be correct pathology, but it presents too unfavourable a view of the consequences of gun-shot contusion of the scalp. My first doubt on this subject arose from the cases stated to me, after lecture, by my pupils who had seen service. I soon had many instances under my own eye, where the musket-ball had been flattened against the skull, and no bad symptoms resulted. Recollecting this case of suppuration on the brain, proceeding from a wound by the wadding of a pistol, it did appear remarkable, when I saw balls lying flattened, and lying under the integuments of the cranium, and absolutely none of the expected symptoms arise. I have witnessed all degrees of injury of the bone by gunshot, even to the bruising of the skull into minute pieces; still the patient recovered, if the dura mater was not opened.

[Still I am very far from objecting to the views of the pathology stated in this chapter. I would only present a brighter prospect, but still watch with anxiety for the coming on of dangerous symptoms, when the bone has suffered contusion.

[There is a branch of this subject which has not been touched upon, and which I believe to be of great practical importance. I mean the effect of erysipelas affecting the integuments of the head, in its influence on the skull. An erysipelatous attack on the head will be attended with a separation of the exposed pericranium, and consequent death of a portion of the skull. The suppuration of the mem-

emples nous sont assez appercevoir que les coups d'armes à feu ne doivent pas être confondus avec les autres blessures de la tête, ou les conjectures que l'on peut tirer de l'instrument qui a frappé, et de la force apparente du coup ne décident rien."

branes which follows is considered the effect of the *contusio cranii*; but it is only indirectly so; it is more immediately the consequence of a bad inflammation coming on the exterior wound.]

It is my earnest wish, that you should learn on this, as in all questions of practice, to draw your own conclusions from fair description and plain facts. From those which I have now laid before you, you will have, I believe, true conceptions of the state of the bone, of its alteration of structure, of its various modes of exfoliating, and of the dismal consequences which often ensue. But, in addition to those plain facts, I take a pleasure in laying before you two descriptions, the one by Dessault, the other by Le Dran, which approach to a demonstration almost of the contused state of the bone; and I also will indulge myself (and perhaps gratify you), by proving, that the ancients have left many evidences in their writings, and many proofs, even in the very terms they use, that they were not ignorant of this state of the bone, nor of its concomitant dangers.

“A man,” says Dessault, “of five and thirty years of age, was struck with a bludgeon over the head; a blow which stunned him for a few minutes, but did not knock him down. He had himself bled in the foot, drank of a vulnerary potion, believed himself cured, and continued well for a month. Then he sickened, lost his appetite, his tongue took on a yellow scurf, shiverings came on, he fell into coma, and died on the sixth day.

“On dissection,” says Dessault, “we found not the slightest outward mark of injury; the scalp was sound, the external table of the skull had its natural colour, but the internal table was blackened through

the whole extent of the parietal bone. The dura mater, lining this part of the skull was of a colour still darker ; yet it adhered as firmly to this surface, as to that of the uninjured part of the skull, while all the lower surface of the dura mater was coated with an ash-coloured viscid pus, which not only covered the surface, and entered among the convolutions of the brain, but tainted its substance to the depth of several lines. The rest of the brain was sound and natural*.”

There cannot be imagined a more perfect example, or shorter description of contusion, pure and uncomplicated. The integuments still entire, without even the slightest tumor, so that the bone had not suffered by any disease from without ; the dura mater still adhering, so that, unless the bone had been deadened by the blow, it might have preserved its circulation from within ; the bone alone had been injured by the blow, so as to affect, in its turn, the dura mater, which alone was inflamed and purulent, in consequence of the death of those parts. But yet, an accidental description of Le Dran pleases me still more. “ A man, who had been wounded with a sword, continued well, and walking about in the

* “ Voici ce que j’observai, à l’ouverture du cadavre. Il n’existoit sur l’extérieur de la tête aucune apparence de contusion ; les tegumens étoient très-sains ; la table externe de la voute du crâne avoit sa couleur naturelle ; mais la table interne étoit noire dans toute l’entendue de la fosse pariétale droite. On voyoit la même couleur sur la portion correspondante de la dure-mere, et même un peu au-delà ; d’ailleurs cette membrane avoit, de ce côté, les mêmes adhérences avec le crâne, que du côté opposé. Il y avoit audessous de la dure-mere, et dans l’endroit que j’ai indiqué, une légère couche d’un pus épais et grisâtre, qui s’étendoit jusque dans les anfractuosités, et qui avoit macéré la pie-mere et la portion correspondante du cerveau, à quelques lignes de profondeur. Le reste de ce viscere étoit dans son état naturel.”

hall of the hospital, till the seventeenth day, in the evening of which day he was suddenly seized with delirium and fever, and soon after died. The first table of the skull was divided by the sword, the second was only contused; betwixt the pericranium and skull was a coat of a sort of purulent mucilage; the same purulent mucus was lodged betwixt the cranium and dura mater, and also betwixt the dura mater and pia mater.

“When I examined the cranium,” says Le Dran, “I discovered the cause of this disorder. There was no fracture; but a contusion, about the bigness of a crown, was visible in the diploe, discoverable by a large black spot, which was of an elliptical figure, in a line with the cut in the external table, and surrounded by several black rays. I have preserved that piece of bone; and, although it is dry, and I have had it for some time, the black spot still appears upon the internal table, and not upon the external; but it is more conspicuous against the light.”

Is it not most natural, that the blow which shakes the dura mater, and separates it from the skull, which bursts its arteries, and occasions effusion of blood, should also burst arteries, and occasion effusions of blood within the substance of the bone? The above description ascertains it, and the expressions used by the best of the older surgeons assure us of its having been long a matter of observation. The true and lively manner in which Fallopius describes the mark for discovering contusion, and claims it as his own, will strike you very much. He was spirited up to write in this kind of language, by a mistake of Vidus Vidius, a clumsy commentator, who does, indeed, talk very coolly about the blackening of the bone.

“ Since,” says Fallopius, “ the contusion of the bone is very dangerous, how, say the commentators, shall it be known? Not by the senses, not immediately after the fall, not till the third or fourth day. It is to be known,” says Vidius, “ by making an incision, —by the blackness of the bone. God have mercy on those, whose physicians think fit to wait the blackening of the bone. Why, bones the most cruelly mangled and depressed, contused, as they certainly must be, do not blacken, if treated with prudence and care; often, indeed, in wounds, the bone blackens, but that is through length of time; how, then, shall we presently know, whether a bone is contused? I have not heard nor read, in any writer, the secret marks of contusion; but they are as follows:—

“ Look to your nails; remark their fresh and lively colour, white, tempered with red, but spotted with specks of a deader white. Those spots have been named by the Greeks *nebulæ*, by us *mendacia*; and exactly such spots appear in contused bone, red at first, but afterwards of this dead white; for the bone changes colour in its various states of life, death, and putridity. The colour of a living bone is white, delicately tinged with red; that of a dead bone, unmixed white; that of a putrid or carious bone, livid or black. This is the cause why, when you first lay open a bone, you find it of a reddish white colour; white, because its earth is of the purest; and mixed with red, because it contains the finer part of the blood, a sort of sanguineous vapour, which, as it is from the blood, is red. And this is my proof, and you may witness it, that when I scrape the cranium, I have scarcely penetrated the surface, when blood begins to flow; and so it is, indeed, in every bone.

“ This being established, it follows, that during the first stage, *i. e.* during the two first days of a contusion, that part which is marked with these specks of blood is still alive. But the blood exhales by the third day ; for then the contused parts are divorced, though without any visible separation from the living bone. They no longer hold a living connexion with it, nor are nourished by a circulation of humours ; hence the redness ceases, and the spots and specks become white, which is truly the colour of a dead bone. Thus do I recognise contusion by the change of colour ; I recognise it also by its blackness ; but this is a mark too decisive, and too certainly fatal, to be waited for.”

That the ancients, the Arabians at least, were no strangers even to that suppuration betwixt the tables of the skull which I have just described, is manifest from the following passage from the works of Heliodorus, as transcribed by Oribasius.

“ OF ABSCESS UNDER THE BONE.

“ The bone which, independent of fracture, is supposed to have pus under it, or matter collected in the skull itself, in the cancelli betwixt the layers of the bone, should be trepanned, and entirely cut away. If, in trepanning, the pus rises through the trepan-hole, it is to be stopped with lint ; for the pus being thus confined, the perforation of the bone is more sensibly felt, while the matter is confined by the instrument. But, when the collection of pus is truly under the cranium, betwixt the bone and dura mater, the membrane having separated from the skull, we are to proceed, as in the case already

mentioned of a fissure, with suppuration of the dura mater.”

This extravasation of blood betwixt the tables of the skull,—this contusion, deranging even the intimate structure of the bone,—the ancients were familiarly acquainted with. They called it “*Sanguis subterlabens*,” which I know not how otherwise to transpose into the language of modern pathology, than by calling it “extravasated blood.” They distinguished extravasation under the skull, from extravasation in the substance of the bone. “The collection of extravasated blood,” says Archigenes, “betwixt the two lamellæ of the bone, resembles the spots under the nails; but the blood being quickly converted into pus, brings on a lividity of the bone. The cure of this by perspiration, and by the exudation of the blood, is easy, but the cure of that which is extravasated upon the dura mater is every way difficult.”

The fact has never been more accurately described by moderns; and, in point of philosophy, they have manifestly declined; for the suppuration under the skull has been ascribed, in modern times, to the putrescence of the many ligamentous fibres which connect it with the dura mater; and the death of the skull itself, to the utter extinction of the radical heat and moisture of the bone. “*Dura menix*,” says Magatus, “*cum pluribus ligamentis cum cranio connectitur, fieri non potest quin ligamenta quæ cum mortuo osse copulatur putrescant, atque supra membranam ipsam colliguntur ichores pravi, &c. Constipantur calvariæ pori, prohibeturque eventatio, et labefactatur rationis calor.*” And Wiseman, very proudly, repeats this profound piece of philosophy:

after describing an exfoliation of the whole thickness of the skull, he adds, “ If you will ask the reason of this, I must tell you, that according to our judgments it was the effect of the contusion, of which, indeed, there appeared no marks. Yet, without doubt, by the force of the blow, the heat was extinguished in the bone, and as a dead bone it separated*.” My purpose, then, is accomplished, if by facts and circumstances I have been able to convey to you a just conception of the state of the bone which is produced by a blow, and has been known and remarked in all ages, “ saving some variations in the phrase,” from the days of Hippocrates, to modern times. The ancients, you will perceive, formed a practical inference, which, most unhappily, has been long since forgotten. For they, from the state of the bone, inferred the dangerous condition of the brain, and from thence that just and most important rule, That we should, in all cases of contusion, operate early, and judge of contusion by other marks than its blackness. “ *Dii boni ! male ageretur cum ægrotantibus, si expectemus nigredinem ossis.*”

It cannot be but that a carious bone may, in any part of the body, remain insulated, surrounded by a fistulous and callous sore, but nowhere is this condition attended with such imminent peril and danger as in caries of the skull. It is not by the period of the fortieth, or even of the hundredth day, or in any limited term, that we are, in wounds of the head, to judge of our patient's danger ; for, as a corrupt and dead tooth may long hold its place (as indeed a gold tooth, or a tooth screwed upon a stump will) in its

* Wiseman, p. 142.

socket, exciting, for a long course of years, only occasional pain, and suppuration, so will a dead bone lie long quiescent and harmless ; and yet, when that final suppuration, which detaches a piece of skull, does come on, it is but too natural (however long the symptoms may have been delayed) that it should endanger the brain. That a contused and deadened part of the skull should remain thus unoffending, and unaccompanied with symptoms, is nothing but what our philosophy can easily explain ; it implies no more than that the dura mater, if it escape the first shock, may secede so slowly from the deadened bone, as to lessen the danger ; in short, that a contusion of the skull may terminate in mere caries. Sometimes the corrupted bone is merely rough and bare, as is felt by the probe, upon cutting into a puffy tumor. Sometimes it is surrounded with tumid integuments, and fistulous openings, discharging a thin and brownish ichor. Sometimes it only excites occasional tumidity, and partial suppurations. Sometimes the dead bone, divorced entirely from the sound, bursts away, as in the case I have related of the drunken woman. Sometimes it is nearly dry, and bloodless, as in a case which I shall presently relate to you. Sometimes the scalp remains entire, while ulceration imperceptibly destroys the bone, and it is so entirely absorbed, as to leave an open circular space. Sometimes, as in a case I shall soon relate to you, the whole cranium is discharged. In short, that contusion which usually affects the brain, and proves fatal on the fifteenth or twentieth day, terminates sometimes in mere caries of the skull ; the patient being, during all the period, in perpetual danger, yet never ill.

It has been the opinion of the profession, ever

since the days of Hippocrates, and by universal assent established as law, that during forty days from the time of any injury of the head, a man is in danger ; that, if he die within that period, it is imputable to the wound ; that, till that period have elapsed, the person cannot be acquitted who gave the blow. By the passages which I now recite to you* (a comment on Hippocrates, by the very learned Magatus), you will perceive, that from the seventh to the fourteenth day, has been in all times acknowledged as the usual period of fever and danger ; while yet a patient was not accounted safe, and out of danger, till the fortieth had elapsed. If, after this critical period had passed over, a man fell into danger, it was lawful, it was merciful, to impute his danger to some error in exercise, or diet, or the passions of the mind, or those other most natural things, which are wisely termed non-naturals†. Yet, some were willing, especially when the dura mater was hurt, to prolong the doubtful period to the hundredth day. How ill the calculation accords with the real fact, how many exceptions there are to this general conclusion, how very far the period of exfoliation, and consequently of danger, extends beyond the fortieth, or the hundredth day, you will learn from the following observations.

“ Donald M'Kay, twenty-nine years of age, after serving long in India, was embarked, in perfect health, for England. The regiment being drafted, the sergeants, corporals, and drum-boys, were sent home.

* Magatus, p. 202.

† “ Mirandum sane Juristas transacto 40. die in capitis vulnere, nullum amplius subesse periculum statuisset, fiquē post dictum tempus letho tradi contigerit ægrotantem, id nequaquam in vulnus rejiciendum esse decernunt.”—Schenkius, p. 18.

They were embarked for home by a circuitous rout ; first put on board at Madras, then carried to Bengal, and thus they spent nearly seven months at sea before they reached the Cape. There M'Kay was suddenly seized with the jaundice, was very yellow, and sickly, with loathing of food, depression of spirits, and that kind of languor which he had often felt during the hot seasons in India. Of this oppressive disease he was not entirely recovered when he arrived in his native country.

“ While coming down the British Channel, sitting between decks, with his messmates, at dinner, a quarrel fell out betwixt two corporals of his regiment, about their shares in the mess. The wranglers were about midships, and when he heard their quarrel run very high, and saw them about to strike, he started up from where he was, sitting by a gun, and being in anger, and entirely forgetful of the nature of the place he was in, he struck his head with such violence against a beam, that he fell back into his chair, and lay for a long time as if dead, with his comrades about him, doing every thing they could to restore him. He recovered in about half an hour ; and, although stunned and stupified with the blow, he was not sickened ; but next day, and indeed till now, a space of four months, has been in his usual health.

“ Of all kinds of blows, this perhaps is the most violent ; and, though his scalp was not cut, nor the least particle of blood drawn, he observed, about the third day after, a tumor, which was from the first very painful. He hoped that it would disappear, and neglected to mention it to the surgeon, but it waxed gradually larger, and from being, as on the third day after the contusion, small, hard, and knotty, no bigger

than the point of the thumb, it was, by the end of the month, as large as a goose's egg, not at all painful, and very soft.

“He was now on shore in England, for he was landed the third day after the blow. His life was perhaps less correct, or regular; he was now exposed to the vicissitudes of weather. He had come to Scotland, his native country, and was stationed at Perth, when the tumor inflamed, became extremely painful, so that he could not wear his hat, and was full of matter, which induced the regimental surgeon to open it with a lancet; matter flowed profusely, black at first, as if from a mixture of blood, and afterwards pure; and from that moment he was relieved from his pains; the day on which the tumor was opened, he was on guard, in good health and spirits, and disturbed by nothing but the pain and bulk of the tumor. When the matter was discharged, and the surgeon passed his probe into the orifice, he was sensible of the roughness of the bone, and M'Kay himself felt it grate against the skull. The tumor was thus opened exactly three months after the blow. About fourteen days after, the right eye swelled very much, and was at last closed, with a soft and puffy tumor, which induced the surgeon to dilate a little the opening in the scalp; but it had contracted again before he came under our care (which was exactly four months after the contusion), and was almost closed, so as to give vent, with difficulty, to a thin and acrid sanies; therefore it needed to be again dilated with the bistoury.

“Upon laying open this ulcer, the bone was felt with the probe, and with the point of the finger, bare, and completely carious; it was soft, spongy, and the

probe entered deep into its substance, insomuch that I was fearful of its penetrating actually to the dura mater; it appeared indeed to me, that the matter of the ulcer was heaved up with such regular pulsation, that it must have actually received the impulse from the motions of the dura mater.

“The symptoms which immediately ensued indicated the greatest danger. It is some time before we feel quite at ease in probing such a sore, and we are still longer before we can perfectly understand what we feel;—it was in this instance not till the fourth day, that I could, without danger or violence, ascertain with my probe the state of the bone, and then I recognised, as in the case of Sharpe, and of the old woman, that deep-ulcerated trench, which separates the sound from the carious bone; when I felt this decided mark, I could certainly predict an exfoliation of both tables.

“But now an alarming and fatal suspicion arose of this being a venereal caries, and of great extent; for, along with the suspicions naturally attached to his profession of a soldier, there appeared a distinct tumor, a new abscess, and upon opening it, a greater extent of carious bone than we had supposed. Upon inquiry, I found that the blow had been immediately followed by a general and extensive tumor; that the fore-part of this tumor being opened, the whole was lessened; the back-part, as well as the fore-part, subsided in size; but the back-part, in proportion as it subsided, formed a distinct tumor, and terminated in a separate abscess, yet such a one as plainly implied, that both suppurations and ulcers opened upon one carious surface. Now his appetite and strength failed; his face was sallow and sickly, and every thing in his

manner, voice, and action, indicated extreme languor. There was a general soreness of the neck and throat, and the head was, by a sort of spasmodic contraction, bent down to one side. He had a regularly intermitting pain of the head, which came daily at three in the afternoon, with a fever-fit, and a heavy and strong pulse. The arteries of his head, he said, beat very strongly, and he felt as if a pendulum were continually swinging in his forehead, with a heavy dull pain over all the head, and a sharp and torturing pain shooting down along the left ear to the contracted part of the neck,

“Such was his condition before the exfoliations took place. A large portion of the skull was cast off. The pulsations of the brain, and the granulations of the dura mater, were distinctly seen, and I allowed two months to elapse before I renewed my notes of his case, when I marked down these circumstances, “that he was now in a very altered condition; his pains in the head gone,—his neck flexible and easy,—his face cheerful and contented,—the opening nearly healed,—his appetite, and general health, improving,—and the cicatrices becoming firmer every day. Nothing of these changes can be attributed to a very slight course of mercury, which he has taken for three weeks only, and has now left off. I look for his being discharged in a very few days, in perfect health.”

I shall presently relate to you a most interesting case, in which, by perseverance on the part of the surgeon, and courage on the part of the patient, worthy of its reward, a carious portion of the skull was successfully cut away. It is my opinion, that the carious bone of a member may be left, till it be

discharged or loosened by nature ; but that when a vital organ, as the brain, is endangered by slow exfoliation, the bone should be removed as soon as it begins to shake ; that life being at stake, nature, when she makes the effort, should be assisted, but always modestly and delicately. There are circumstances, in which it is plainly our duty, not only by shaking and moving the deciduous piece, but by cutting and trepanning the skull, to remove it ; for, when the integuments have sloughed off ; when much, or the whole of the cranium is bare ; when the dura mater is ulcerated over almost all its surface ; when one separated piece of bone supports an ulceration and carries over a great extent of the skull ; I should (in hopes of removing that insulated piece of bone) proceed to the most dangerous and fatiguing (for these are not painful) operations, as freely as I should pull a thorn out of the flesh.

The following interesting case, communicated to me by my able and much-esteemed friend Professor Jeffrey, and related by his nephew Mr. M'Dougall, who attended the patient in her last moments, will, I believe, be highly gratifying to you. As the patient I have just alluded to was saved through perseverance and courage, this young woman was lost from perverseness and fear ; yet I know not how we are entitled to use so harsh a word as perverse in describing the waywardness of a patient who feels all the horrors and confusion, without being conscious of the necessity, of the usefulness of an operation, so unusual as that of cutting out an extensive portion of the skull.

“ A young woman, living then in London, about six and twenty years of age, was struck down by a

smoothing-iron falling from a height where it had been carelessly hung, perpendicularly upon her head. It struck her on the top of the head, on the upper part of the left parietal bone. She was conveyed to an hospital in a state of insensibility, and continued delirious for some time. She was bled, the head shaved, the wound in the scalp enlarged ; and when she recovered her senses, she complained of a sense of giddiness, accompanied with pain of the head, which continued for many weeks. Of the state of the bone she had never been distinctly informed, but could perceive at the end of some months, that the surgeon, or his assistant, at each dressing attempted to extract a large piece of dead bone, which was moveable, and which they shook and pulled in various directions. During these attempts, the sore was dressed with lint, and poultice was occasionally applied.

“ She remained very long in the hospital (eight or nine months), where her health having suffered greatly, the physician suggested to her the propriety of removing to the country. She complied with this advice ; and after three or four months spent with her friends, she returned to the hospital much recruited. Many and various attempts were now made to disengage the insulated piece of bone. Her health began again to decline, her appetite failed, she was greatly reduced by fever, fits, and profuse perspirations. The discharge from the carious ulcer, profuse as it had always been, was now greatly increased, becoming more profuse, and extremely foetid, as she fell weaker. Nourishing diet and cordials were not spared. She felt that her health could not improve in the air of an hospital in London, and resolved to

return to Scotland, to live or die among her friends : weak as she was, she performed actually this journey of four hundred miles in a mail-coach.

“ When leaving London, the gentlemen under whose care she had been charged her never to permit any operation for the removing of the carious part of the skull. They remarked, that the bone, which was slowly decaying, would be at last disengaged by the ulceration and erosion destroying those parts by which it was surrounded ; that to this alone should she trust ; the process of nature, they said, was safe, and sure to happen, if she could but regain her health ; the expedient which would probably be proposed to her, of applying the trepan, extremely dangerous.

“ On her arriving in Glasgow, and applying to Mr. Anderson, an eminent surgeon in that city, his opinion was so entirely opposite to this, he was so persuaded of the propriety of removing this insulated bone (now entirely uncovered), and of great extent, that he remonstrated with the patient, argued with her friends, and assured all who had an interest in her, that the pain, irritation, diarrhoea, and fever, the want of appetite, and profuse discharge, could not fail to bring her soon to the grave. But still his advice was neglected, till at last her health manifestly declining, and her situation being in all respects hopeless, the operation was assented to.

“ With the design of afterwards bursting up the corrupted part of the bone, he applied the crown of a very large trepan nearly on the centre of this extensive caries ; an operation which was not accomplished easily, nor at once ; for such was the perverse and fretful temper of the patient, fatigued with

pain and suffering, that she submitted very ill to the operation; such, indeed, was her real weakness, that in place of completing the perforation at once, Mr. Anderson thought it prudent to allow two days to elapse betwixt the first and second application of the trepan.

“By this central perforation, the insulated bone was converted into a broad ring; it was of the form of a quoit; and a second perforation, with a smaller crown of a trepan, would have divided the ring, have reduced it into the form of a crescent, and have enabled the operator to break up and extract the caries, without endangering the dura mater. But he was not permitted to complete his operation; if there was either danger or pain in the operation, he had done all the harm, but was permitted to do none of the good that might have been expected. Though prevented from fulfilling his more important duties, he continued his charitable visits to the patient. He still hoped, in some period of pain, or from a deliberate conviction of her danger, that she would allow him to complete his operation; but, wearied with opposition, and finding himself really useless, he at last withdrew.

“It was from charitable motives only, to soothe and alleviate her distress, without the slightest hope or design of offering any more important assistance, that Mr. M'Dougall now agreed to attend her, and assist her friends in applying the dressings, and keeping her sore in the best condition. The state of matters at this period is excellently well represented in the following report by Mr. M'Dougall.

“On removing the bandage and dressings, I had now an opportunity of seeing the extent and appear-

ance of the disease. The scalp had ulcerated and sloughed off to the extent of five or six inches in diameter, exposing almost all the upper part of the skull. The insulated piece consisted of the upper and back part of the right and left parietal bones. It extended from the lambdoid suture behind, to within two inches of the coronal suture before. The sagittal suture was seen to run along the middle of this caries, which measured transversely five inches, and longitudinally three inches and a half. A great part of the external table of the loose bone had mouldered away, and the dura mater was seen through the trepan hole, and through many ulcerations in the skull, covered with pale unhealthy granulations. The edges of the scalp were swollen, livid, and painful, and the discharge of pus was profuse, of a dark colour, and very foetid. The insulated piece of bone was immersed in matter, blackened on its surface, and incrustated with the discharge. I could easily move this piece of bone a little way upwards or downwards, or to either side, the thin edges of it passing at each movement under the edge, or between the tables of the surrounding bones. It could even be depressed a few degrees, though the resistance to this was very considerable; nor did the patient complain of any uneasiness. It was this resistance that enabled Mr. Anderson to apply the trepan on the insulated piece of bone itself.

“Compresses had been applied to prevent the matter from descending betwixt the cranium and scalp, but without success. The matter had worked its way downwards, forwards, and backwards, had destroyed the cartilaginous tube of the external ear, giving a free exit to the discharge through the ex-

ternal meatus, and had separated the scalp from the squamous portion of the temporal, from almost the whole of the left parietal, and from a great part of the occipital bone. The matter had descended to the neck, and formed a large collection there, which pointed; but the patient would not allow of a counter-opening. The application of compresses, to prevent its accumulation, was now out of the question, for the scalp covering the left and back part of the cranium had become livid, and extremely painful to the touch, and as thin as paper. A bent probe, when introduced under the scalp directly backwards, could be passed down to the neck, and made to turn round the convexity of the skull, till it was withdrawn opposite to the ear. The bone felt rough, and denuded of pericranium throughout this whole circuit. The matter exuded also from under the bones of the cranium, and had detached the dura mater from them to a considerable extent laterally, and downwards to the base of the skull.

“ The ulcerated scalp was dressed morning and evening with a pledget of lint, covered with soft ointment. Tow was applied above the lint, to absorb the matter, and the whole was retained by a bandage loosely applied. At each dressing, about an English pint of a dark coloured foetid matter, very much resembling coffee grounds, could, with gentle pressure, be forced up from the neck, and from betwixt the cranium and scalp on the left side, and discharged at the large opening above. The scalp bled on the slightest touch, but the blood was almost without colour.

“ The patient had at this time survived the acci-

dent twenty-three months. She lived about a month longer, her debility daily increasing till she died.

The loathsome condition of this poor debilitated creature, with the profusion of matter running from the head, the integuments insulated down even to the neck, the extreme foetor of such an extent of carious bone, may be easily conceived. One circumstance is mentioned, in which you will find an interest, since it corresponds with many of the facts I have lately laid before you, viz. that the dura mater, which was detached and ulcerated to so great an extent, was thickened wherever it continued to adhere to the skull *."

I do not know a case by which the parallel I have ventured to suggest, of a contused skull with a carious tooth, is so well vindicated, as that recorded by Mr. Mareschal, of the French Academy, in the following terms: "A young lady, of about ten or twelve years of age, was struck with a triangle of iron, which fell upon her head. There was no wound. The young lady was soon well, but there remained a fixed and pointed pain in one spot, in the place of the parietal bone. This pain was aggravated from time to time in paroxysms, so violent as to be attended with fever. The fits of fever were abated by bleeding, and various remedies, but the pain continued for years, and was so excessive, that they were induced to consult Mr. Mareschal, and to comply with his advice, when he

[* There seems to have been an error here in the instrument used. If the loose bone had been held firm, and the small cranium saw used, simply to divide the portion across, the pieces would have been easily elevated and brought away. The trephine was not the instrument to use in such a case.]

recommended that the trepan should be applied. The opinions delivered by the surgeons, and the submissions of the patient, imply great suffering, else the one would not have proposed, nor the other have endured, an operation so doubtful in its issue. Mr. Mareschal laid open the bone,—applied the trepan, and remarked, in sawing the skull, that it was as dry as a church-yard skull; and the operation was so perfectly successful, that from that moment the pain entirely ceased.”

Nothing can be more certain, than that the caries of the skull may continue harmless: that it is the suppuration by which the piece of insulated bone is separated from the sound skull, and from the dura mater, that occasions danger: that there are not always symptoms denoting that danger, so as to lead us to take measures to prevent it: that while the danger is suspended for months, the moment symptoms of a bad tendency appear, we have reason to pronounce the patient lost, past all remedy. I do not remember any more conspicuous example of this, than a case related by Morgagni, in support of that weak unfortunate prejudice which he had taken against the operation of trepan;—unfortunate, for, in the cities of Italy, hundreds perished unassisted; and weak, since the very facts by which he maintains his opinion are expressly such as a sensible or experienced surgeon would have looked upon as but too certain proofs of the folly of depreciating, and the danger of neglecting, one of the most necessary operations in surgery.

“A young woman (and here not having the original by me, I am obliged to trust to a pedantic and

ignorant translation), of no mean parentage, of a slender make, of a weak but healthy constitution, who had never had any disorder, except that she had once been afflicted with some convulsions, which did not continue ; being in good health, and sitting on a low seat, she was suddenly alarmed, and hearing a loud noise, she started backwards, so as to strike her head violently against a marble slab which projected from the wall.

“ This happened on the last day of March, in the year 1739. She felt no inconvenience for some days. Then there was a slight pain in the part injured, followed by a painful rigidity of the muscles of the neck. Yet these symptoms were so very slight, that the patient went about the usual occupations at home or abroad. Who, then,” says Morgagni, “ would at such a time have proposed to trepan the cranium? what consultation would have authorised, what delicate woman would have submitted to so severe an operation?”

Take now the rest of this history. “ She went on thus to the month of August, without any other inconvenience than what I have just described. On the sixteenth of the month, I was sent for, when her regular physician gave me the narrative which I have here detailed. He further said, that she had been feverish for some days ;—that her pulse was hard ;—that the muscles of the neck were swelled, rigid, and pained ;—that a similar pain descended along the spine, and that the lower jaw was almost fixed ;—that she was lethargic, answered very slowly ;—that she was occasionally delirious ;—that her right side was somewhat affected ;—that her eyes appeared

slightly convulsed ;—that these latter symptoms had remitted for a few days past, while the others continued.

“ He also mentioned, that the pain in the injured part had of late returned, though without the slightest external tumor, or discolouring. On seeing the patient, I felt but too sensibly that all he had said was true, that there was now no room for remedies. Having, therefore,” says Morgagni, “ proposed some things of little importance, on which no calumny could fall, merely in compliance with custom, I called aside one of the elder relations, told her how much I feared for the patient’s safety, and took my leave, with the design of returning no more ; and indeed her speech forsook her a few hours after I had taken leave of her. In two or three days she died *.”

This is the very case of the Serjeant M’Kay, with that sad variety of symptoms which we always have reason to fear. But Morgagni wanted impartially to reason, on this, as on an indifferent point, or to perceive that there can be no principles for the treatment of abscess in any less precious organ, that may not apply to abscess of the brain : that every abscess, to save the surrounding parts, may be opened : that an abscess is to be more carefully watched, and earlier opened, in proportion to the strength and resistance of the capsule, membrane, fascia, or bone under which it is confined : that, *a fortiori*, the brain, the most important organ of the body, must be preserved from suppuration at every risk : that no force of suppuration can make its way through the skull : that

* Alexander’s Translation, vol. iii. p. 140.

although the distinct fluctuation of matter, the positive proof of its existence, must be in other parts our sole rule of conduct, suspicion, mere suspicion, calls us to open any abscess that threatens the brain. Morgagni had not the impartiality to reflect justly on this case; to reflect, that death was pronounced to be inevitable, while safety seemed possible: he pronounced the patient dying; and surely it is not possible to be worse than dead. He who thus pronounces sentence of death proclaims (according to the often repeated adage) any remedy desirable. His blameless remedies were culpable negligences, and his "compliance with customs" a dereliction of duty; and to speak thus tenderly of his own reputation, while neglecting his last duties to this patient, though a language extremely common, is such as cannot be approved. "To escape calumny" may be thus an object with the physician; but we perceive, that in regard to the patient it is a kind of treason. There is, in every profession, as well as in war, a bravery and spirit of enterprise, which opens the way for good fortune; and, in this question, it is most natural to remind you, that an operation can give no pain to a patient who has lost his feeling; that the perforation of a bone is to be judged right or wrong, not by the pain, for there is none; but by the necessity of the case, when there is no other hope for life; and by the chance of safety, however slender it may be.

Such accidents are, indeed, a matter of daily observation, and it should enter into your reasoning on every slight affection of the head, where a person, though in apparent health for months, remembers to have had a blow. "I remember," says Marchetti,

“ another patient, who being hurt on the top of the head, but without any uncovering of the bone, or any dangerous sign, was cured by his surgeons, and continued for three months in uninterrupted health. At the end of that time he was seized with a low fever, but without the slightest relation to his head. On the seventh day, he was distracted with pains in the injured part of the head, though it had been long healed, and now showed no signs of any thing wrong. On the fourteenth day of the fever, he died. On dissection, I found pus upon the dura mater and brain : so false is the vulgar opinion, that after the fortieth day, a man wounded in the head will not die.”

“ A young man being struck with a stone on the parietal bone, the wound was cured in the usual time. But, about ten years after, a small soft tumor was observed on the injured part, having a very visible pulsation, and accompanied with excessive pain when pressed upon.

“ Those who were consulted pronounced it an aneurism. Various quackish prescriptions were applied to it. The pulsation and headaches increased. The fever was unremitting. The patient was altogether deprived of rest, and the tumor pushed out to the size of the largest hen's egg, occupying a great portion of the right parietal bone. The pains of the head having become excessive, and extended from the diseased side over all the head, the patient would have it opened, in opposition to the opinion of several practitioners. The opening of the tumor was followed by hæmorrhagy ; from the centre of the tumor, they hooked out with the fingers many clots of blood ; and when the sore was thus cleansed, there was seen,

through a large opening in the skull, the dura mater, white and sound. But, from loss of blood, the patient fainted; his pulse fell very low, and, in a few hours after the opening of the tumor, he expired. On dissecting the head, there was found a great loss of substance in the parietal bone. The dura mater sound, but depressed, so that the right hemisphere of the brain was repressed towards the left side *."

Neither the slightness of the injury, nor the slowness of this process, nor the final unhappy fate of the patient, nor the entire destruction of the ulcerated bone, must surprise you, for these are phenomena perfectly consistent with the most common laws of the animal economy, and confirmed by many similar facts. There is a narrative of the same disease, produced by the same cause, a slight blow, enduring for ten years, growing with the body's

* "Une jeune homme reçut un coup de pierre sur le pariétal droit. Il en résulta une plaie qui parut se guérir complètement dans un espace de temps assez court. Mais environ dix ans après, on vit dans l'endroit qui avoit été frappé une tumeur molle, qui avoit des pulsations bien sensibles, et qui causoit beaucoup de douleur au malade quand on la comprimoit. Des personnes de l'art consultées décidèrent que cette maladie étoit un aneurisme. Différens topiques indiqués par des charlatans furent appliquées. Les douleurs de tête, et les pulsations de la tumeur, augmentèrent : la fièvre devint continue, et la malade fut privé de sommeil. Cette tumeur augmenta peu-à-peu, et acquit insensiblement le volume d'une très gros œuf de poule. Elle occupoit une grande partie du pariétal droit. Les douleurs de tête étant devenues excessives, non seulement dans l'endroit où étoit la tumeur, mais même du côté opposé, le malade la fit ouvrir malgré l'avis contraire de plusieurs praticiens. L'incision faite, il y eut une hémorrhagie assez forte, et l'on retira avec les doigts du centre de la tumeur plusieurs caillots de sang. Lorsqu'elle fut complètement vidée, on vit à travers un grand trou au crâne la duremère, qui étoit très blanche. Le malade tomba en syncope par le perte du sang, son pouls s'affoiblit, et il mourut trois ou quatre heures après l'ouverture de sa tumeur. On examina la tête, et l'on vit une grande déperdition de substance au pariétal, la dure-mère dans un état sain, mais déprimée ou enfoncée, ainsi que le lobe droit du cerveau qui étoit repoussé vers le côté gauche."

growth, and strengthening with its strength, but at last cured by a nice and delicate operation, related by Wiseman, serjeant-surgeon to Charles I.

[Here Mr. John Bell had introduced a very long case, with the original Latin, of which this recapitulation may now be sufficient.]

I have translated thus, faithfully, a case which has often been the subject of comments, a case much misunderstood, that being described as a fungus, which is plainly a caries of the skull. This long and interesting narrative carries with it very important pathological facts. It is a case solitary almost in the records of our science, and the success of these rude but necessary operations, in which a space of six inches circumference was cut out of the skull most fortunate. You will have remarked, as I described in succession to you, the several phenomena,—the extreme cold, succeeded by immediate heat,—the sudden pain,—the slow progress of the disease,—the extent of the caries,—and the insignificance of the fungus. I am not sorry to have translated, for the first time, this narration from the Gothic Latin in which it is told; it is a case of caries in the skull, as nearly parallel with that of the boy's tibia, recovered from cold, as can be imagined, and well calculated to demonstrate the sudden effects of cold seconded by heat and fever upon the structure of a bone.

First, a strong and vigorous man travels post by night, in weather intensely cold, and though inured to service, in Brabant, with the army, he feels all its intensity, and ascribes to it all his distress. He arrives at his house, and is received in rooms heated, after the German manner, with stoves; and there having hardly embraced his friends, he is struck with

a sudden and violent pain in the head ; and, I doubt not, had the detail of his case been very perfect, we should have found, that, like the herd boy, he had passed the first night in feverish dreams, and great disorder. During seven weeks, the pains are unremitting and torturing ; and while the bone was thus inflamed, surely the dura mater could not fail to separate from it ; the moment the pains cease, the vertigo is perceived, which marks the exact period of this kind of danger. The pains return, his whole scalp swells, and then by suppuration the swelling becomes limited to the part affected, to the region of the carious bone. Again, at the distance of fourteen days, the puffy tumor rises ;—the scalp is plainly detached from the deadened cranium ;—the tumor subsides, but the sore never heals ;—the bone, covered by fistulous integuments, distils a serous humour ; and we have every reason to believe, that when the integuments are no longer able to hold connexion with such diseased bone, the dura mater, on its internal surface, cannot remain sound. This caries, then, or febrile necrosis of the skull, is plainly the original disease : the separated dura mater might well put on (in this separated state) a disposition to generate fungus : yet, when, after a year's suffering, and innumerable consultations, the physicians and surgeons resolved that the trepan should be applied, when a great circle, of six inches of circumference, is cut away, there is, in proportion to this extent of caries, a fungus so insignificant, that except some slight astringents, soaked in Malmsy wine, and (towards the end of the cure) some slight applications of the caustic, we hear nothing of the fungus ; it is adventitious only ; it does not protrude through the

skull, nor, though cut down, does it grow up again like a true fungus, in one night; it wants every essential character of fungus; it resembles nearly the vigorous granulations of a healthy but suppurated dura mater; and heals so equally along with the bone and integuments, that we are no more entitled to describe this as a fungus of the dura mater, than as cancer of the brain.

OF SUPPURATION OF THE BRAIN, FROM WHATSOEVER CAUSE IT PROCEEDS, WHETHER FROM LACERATION OF THE INTEGUMENTS, SEPARATION OF THE DURA MATER, OR CONTUSION OF THE SKULL,—OF THE SIGNS OF DANGER, AND THE PROPER TIME FOR OPERATING, —WITH AN ANALYSIS OF THE OPINIONS AND PRACTICES OF THE MOST ABLE PHYSICIANS AND SURGEONS ON THIS IMPORTANT QUESTION.

You will now perceive, that contusions of the cranium lead naturally to one of two forms of disease; either to a mere exfoliation, a disease limited to the bone, and long protracted, yet in no period void of danger; or a present affection of the dura mater, penetrating in a few days to the brain itself, and followed by very sudden death. If, in demonstrating to you the various affections of the lacerated scalp, separated dura mater, and contused bone, I have treated individually and distinctly of affections which are oftener combined, it is with the purpose, first, of proving, that they do happen independently of one another; and, secondly, of accustoming you to reason correctly on the individual facts; and teaching you to distinguish the peculiar constitutions and affections of each part, so as to be able to foretell the dan-

gers resulting from each particular injury. But these parts having one common circulation, and a mutual sympathy and dependence, it cannot be but that, in most cases, the blow which affects the bone, by contusion, must shake the dura mater, and deaden the integuments, and produce, by this complicated injury, symptoms different in complexion (and more immediate in their consequences), from any I have yet described. I have described chiefly that form of contusion, where, along with a mere caries, there is a slow separation of the corrupted bone, and little danger; but not that where the period is short, where the symptoms immediately follow the injury; where, though there is no external wound, nor apparent bruise, to intimate the patient's danger, there rises, after a few days of shiverings, and indescribable confusion of head, a puffy tumor, the surest mark of danger, and where in a few days more the brain is deeply affected, and the patient dies. I am now to explain to you the principles on which this case is to be resolved, the rules and data, according to which a consultation, the most solemn and interesting in our profession, is to be conducted. The confusion of head, shivering, and fever, are all too slight for the patient to feel, or his friends to apprehend, or any but his surgeon to estimate justly the danger of his situation. The symptoms are too slight to allow the mention of an operation, esteemed the most hazardous in surgery, which yet must be immediately performed, else the man is lost without redemption. Not one among you, perhaps, is destined ever once in his life to perform lithotomy, but there is not one of you who will not be daily called upon, in future practice, to decide upon the most difficult of all questions re-

specting injuries of the head ;—to deliver before a jury a sentence on life or death ;—to proclaim the motives and principles of your practice, your reputation being involved in the fate both of your patient, and of the criminal accused of his death. The phenomena which I have hitherto described are chiefly those of caries, affecting only the bone, protracted for months or years, and often void of danger. But the train of symptoms I am now to describe are those from which danger is inseparable.

A man, in a quarrel, or in a riot, is knocked down with a brick-bat, or bludgeon. He is, perhaps, only stunned by the blow, and does not fall down : he is sickened, faint, cold, and pale, but in a few minutes he feels quite recovered : often a blow apparently more terrible is harmless : but whatever may be the force, there is unhappily no criterion of the effect of such a blow. Though a patient thus hurt is apparently well, and goes about his usual occupations, he feels a depression of spirits, and a confusion of head, —a want of appetite, and loathing of food. He is in a faint, languid, and nervous condition : his hands tremble, and his head swims upon being hurried in exercise, or disturbed with any unusual emotion, and he passes the night in unquiet sleep, and terrifying dreams, from which he wakes in indescribable confusion, from time to time. In a few days, the part injured, though at first it was hardly livid, rises into a puffy tumor, round, soft, regular, circumscribed ; important only as it is connected with these signs of danger, and as it implies a detachment of the dura mater, and contusion of the bone.

In a few days, the fever is more conspicuous (though perhaps the tumor is flattened), with slight

horrors and shiverings ; the confusion is more distressing, attended with pain, and a sense of girding in the head ; he can no longer endure the light ; the eyes are red, swollen, and gummy (the oculi subpingues of the ancients) ; the pulse is quick and weak ; the tongue foul ; the skin parched ; the visage pale and ghastly, with a hectic flush upon the cheek ; the urine pale, and sparing in quantity ; the hands, and the tongue, when he puts it out, tremble. He knows not what ails him, but is night and day in a state of indescribable confusion. During the night, roving, grinding the teeth, and slightly delirious ; and during the day, desponding, oppressed, and sick.

If the surgeon be fully aware of the import of these slight, but alarming signs, he opens this puffy tumor with the scalpel, and finds the bone dry, and whitish, or inclining to yellow. He knows by the aspect of the pores, which are the holes by which the arteries enter it, that it is dead. He applies the trepan, and upon taking out the piece, finds that there is a slight coating of cream-coloured pus upon the dura mater, and congratulates himself, not without reason, on having anticipated the danger, and saved his patient's life ; for usually the symptoms subside after perforation, the dura mater reddens, granulates, and heals along with the scalp, with which it unites in one common cicatrix.

But if the patient be regardless of these symptoms, unconscious of his situation, or indifferent to the entreaties of his surgeon ; if any how this happy interval be neglected, the ulcer, which was in this stage confined to the dura mater, extends to the brain. The confusion of head, and fever, increase ; the patient becomes stupid, and drowsy, and wakens from sleep

in great confusion and alarm. He has longer shiverings, and more continual sickness; his knees totter under him, his hands tremble, and his face is often slightly distorted with spasms; and his limbs, especially of one side, are often slightly convulsed; and growing gradually weaker, he sometimes becomes paralytic of one side, but usually becomes only more stupid, and oppressed, and suffers slight convulsive paroxysms before he dies. During the first eight or ten days, he is in this state of languor and sickness; from the tenth to the twentieth, he is in manifest danger; and usually before the twentieth or twenty-fifth day, he expires.

The nature of this puffy tumor, and the sad pre-sages to be drawn from it, are now plain to you. The blow which contuses the bone deadens the scalp, and that surface which is next the cranium is chiefly affected, in consequence of the hard resistance of the bone. The surface of the scalp, in contact with the contused skull, is gangrenous, and thence the tumor is emphysematous, soft, uninflamed: the deadened part being limited, gives a circular form to the tumor; by the extravasation of blood, and inflammatory thickening of the surrounding parts, it is circumscribed; and by its relation to the contusion of the bone, and the probable separation of the dura mater, such tumor becomes the most infallible sign of danger. Nor is it to be doubted, that such puffy tumor arises from the contusion of the bone, and the bruising of the scalp; for the separation of the dura mater will not cause it. Often have I seen the patient, who had great effusions of blood betwixt the skull and dura mater, lie for days or weeks oppressed and unassisted; but never have I seen such separation of

the dura mater marked with puffy tumor. I have here described the most common course of the process, which usually lasts fifteen or twenty days before it affects the brain, and is so uniformly the consequence of contusion, as to make the examples I have lately laid before you, of symptoms delayed for months, mere exceptions to the general law. The usual inference, though not universally, is generally true, "That the danger arising from contusion, or wounds of the head, must appear before the fortieth day." The rules which nature points out for our conduct are so very plain, that, had nothing been written on the subject, I had found little now to write. But every doubt must be removed from your minds, and your direct line of conduct ascertained by authority, as well as pointed out by reason. If there be a case which the ancients understood, it was this of suppuration of the brain, proceeding from a contused bone. From the nature of their arms in fighting hand to hand, from the partial warfare of innumerable rival states concentrated in a narrow peninsula, they had so many opportunities of observing the stages by which a blow becomes fatal, that all the circumstances of the contused bone, shiverings, fever, and other ill signs, were perfectly understood; and long before books of science were written, or opinions and systems began to be perplexed, Hippocrates had announced, in the form of a simple aphorism, those facts which we labour, through many pages, to prove, and find it difficult to bring back to the simple truth. "When the cranium," says Hippocrates, "fractured, contused, or otherwise injured, is neglected, and neither rasped on its surface, nor perforated, as needing no such care, the fever appears in summer on the 7th,

though not in winter till the 14th day. Thus, the bone ulcerates, changes its colour, and discharges a thin sanies ; and, being inflamed, it naturally perishes, becomes yellow or livid, as if soaked in brine ; and when it becomes thoroughly corrupted, grows first intensely black, and then white again. Some, having gangrene of the brain, perish in summer on the 7th, in winter by the 14th day. Wherefore, when you perceive the accession of this fever, accompanied with other threatening signs, you must make no delay, but either scrape the surface, or perforate the bone through to the dura mater."

Archigenes describes in like terms the condition of those who have the dura mater inflamed : "*Ex læsis membranis apparet, ideo, enim febres cum horrore accedunt, faciei rubor, et calor longe major, quam pro febris modo, somnique tumultuosi, oculi subpingues, et gramiosi, et rubentes ; ulcus neque alitur, neque pus maturat, et sordidum fit. Nonnullis et in lingua pustula oboritur. His ubi cito manus admoveatur, spes aliqua subest salutis, ubi serius plerique omnes moriuntur.*" "When the dura mater is inflamed, then come shiverings, and fever, and flushings of the face, quite disproportioned to the degree of fever ; disturbed sleep ; eyes heavy, swelled, and gory ; a sore, flabby, and foul, with ill-digested pus ; sometimes pustules cover the tongue. Those who are speedily assisted have some chance of safety ; but when help is even but a little delayed, they almost always die."

These consequences must have been long observed before they were recorded : these conclusions, so very important in practical surgery, have stood uncontro-

verted for three thousand years. The various stages of death in the skull are marked by the ancients with simplicity and precision, as becoming first dry, then yellow, or livid ; and when thoroughly corrupted, entirely black, or black verging again towards a dead whiteness : thus we are led back to that sound and judicious rule which I have delivered to you in the words of Fallopius : “ Woe to the patient whose surgeon waits for the blackening of the bone.” In cases of fracture, there may, indeed, be doubts : the danger is eventual, the operation merely preventive. Fracture may cause a suppuration of the brain and membranes at some future period ; but contusion is the disease itself, it is the actual suppuration of the brain, announced by infallible signs. Of all the cases in surgery, this is the least equivocal. Of those who have fractures of the skull, many even in the most alarming circumstances survive unassisted ; but in contusion, followed by suppuration, unless the skull be perforated, unless the abscess be opened, all must die.

Hippocrates refers, in all his cases and representations, to war and weapons ; and suggests, with that sagacity for which he has been famous, that we should watch with peculiar care those who are struck with greater violence, and estimate the danger of the contusion according to the force of the blow : “ *Rumpitur autem os et obscuris fissuris et manifestis : et contunditur obscuris contusionibus : et intro ex sua maxime cedit, quum alter ab altero sauciatur, de industria sauciare volens : aut quum ex altiore loco sit jactus,—aut plagæ ictus, uter tandem fuerit, magis quam ex plano loco :—et si contineat manu telum,*

sive jaceat, sive percutiat ; et si fortio rem debilior vulnerat *.”

“T. a big gross man, of about thirty years of age, was (upon I know not what quarrel, but I believe in defending a little boy who had been abused) knocked down with a brick-bat. The fellow who had abused the boy, and then revenged himself upon the innocent man who interposed, was notorious for his savage dispositions, and for such uncommon bodily strength, as to leave no apology for his lifting any thing like a weapon. He lifted half a brick, and, standing on a stair to which he had retreated, threw the brick with all his force, and hit T. on the head a blow which felled him to the ground. He lay very long insensible, for the space of a day and a night, in his own house, so that had we seen him at this period, we might have apprehended some bursting of blood-vessels, and extravasation within ; but he revived, recovered his senses entirely, found the cut on his head very trivial, and would have returned to his trade, but for that indescribable sickness and languor which hung about him, without any remarkable symptoms, to the hour of his death.

“Deep as the ulcer had penetrated into the brain, and early as the symptoms began in this man, they were all along very slight. He had hardly recovered from the insensibility, when the shiverings commenced. On the third day he had frequent fits of shivering, of a quarter of an hour’s duration, followed by heat and thirst. A purge (which I prescribed on the fourth) of jalap, and submuriate of mercury, operated smartly, and relieved the pains in his head. Next

* De Cap. Vuln. xii.

morning, I found the vertigo, headaches, and tinnitus aurium, almost gone, and he felt nothing but a degree of weakness, and languor, and disturbed sleep. On the sixth day, I found this giddiness, languor, and pain, increased, but again relieved on the seventh, by the operation of a second purge; and, on the eighth, he mentioned but slightly the pain of the head, and seemed chiefly distressed by the debility and languor. In this state did I watch him carefully, the headaches being relieved, but the languor increasing, till the tenth day, when, besides the oppression and languor, he felt sickness,—an increase of the headaches,—long-continued chillness and horrors,—a degree of confusion during the night; and he awakened, not as from a refreshing sleep, but oppressed in an unusual degree, with a hot skin, and a fretful pulse; and he had that degree of constipation which I know not whether to ascribe, in such cases, to sudden confinement after a state of health, or to an incipient state of paralysis, which affects always, I observe, the viscera, before it sensibly affects the limbs. By a repetition of the purge, his confusion of head, and sickly feelings, were again abated, and something of cheerfulness and content was visible in his countenance. He remonstrated strongly against the cutting off of his hair, under pretext of the ill effects which he had always experienced from cutting his hair, which infallibly, he said, produced headaches; but really, I believe, for fear of this being but a prelude (as it was indeed designed) to some operation.

“The small wound was now puffy and livid; the adjacent skin began to be undermined, and the probe, when introduced, ran along some extent of naked

bone. The pulse had risen beyond a hundred, the tongue was white, the belly still costive, and the night of the fourteenth he passed in a sleepless, perturbed state, succeeded in the morning with headache, a permanent sense of coldness, sensibility to light, and that character in his features, and in all his motions, of oppression and extreme languor, which is inseparable from a suppurating brain. An uninformed person would expect suppuration of the brain to be marked by convulsions or delirium, while one at all acquainted with such scenes knows, that it is distinguished only by extreme weakness, not by the violence, but by the total absence of symptoms. The man knows not what ails him; the surgeon perceives his condition, but the patient hardly complains, unless it be of sighing, oppression, slight confusion of head, shivering, with a feeling of coldness at the accession of each febrile paroxysm, and trembling of the hands, and tottering of the knees, when either his mind is alarmed, or he endeavours to exert his strength.

“ This man I had destined for operation, conscious that no earthly power could save him, if that suppuration was allowed to come to maturity which was plainly begun. But he was reserved for a different fate; for the natural course of rotation of the hospital having delivered him into other hands, I met him wandering in the cold stairs of the hospital, his eyes indeed open, but his senses gone, at the moment he should have been under the operation of trepan. On the thirteenth day, an incision had been made, so as to prolong the cut on his head, and expose the naked part of the skull, which was nearly on the top of the head, close by the sagittal suture. The bone was

bare, and was known to be so for many days ; but it was not supposed dead. The incision healed, or seemed at least in a healing condition ; and for his sickness effervescing draughts were prescribed. He continued, with slight variations of pulse, countenance, and intellect, in the same ailing condition, from the thirteenth to the seventeenth day ; but his vomiting was now severe ; his rigors lasted sometimes half an hour ; his complexion was wan ; his features contracted and pinched ; his eye heavy and melancholy ; his fever increased, and his pulse beating 112 ; and though generally feeble, it was sometimes very strong. Even in the hour of visit, his vomiting was so incessant, his shiverings so violent, and his pulse, at the same moment, so weak and trembling, that it could not be felt. On the eighteenth, the confusion of head, the ringing of the ears, the fever and shiverings, and all the marks of disorder, were so much increased, that the operation could be no longer delayed ; but, unhappily, the man was, by eighteen days of suffering, reduced so very low, that the chance of his being saved by it was indeed very slight. Upon perforating the skull, a profusion of ripe pus flowed from the trepan-hole ; and he was committed to bed, where he passed an indifferent night. In the morning, though no shiverings were reported, he was chill ; and, in place of the oppressed and dejected countenance which he had before operation, his looks were wild, and his pulse extremely rapid.

“ On the second day after the operation, the dura mater looked black and sloughy, the discharge foetid, the matter continued to flow profusely from the trepan-hole ; yet his looks had changed again from wild and distracted, to oppressed and anxious ; the

shiverings, he said, had ceased, because he had refrained from cold drinks, but his head was sadly confused. On the third day he fell lower; his senses were perfect, but his looks expressed unspeakable distress; the matter was brown, thin, and foetid, the wound dry and glazed, the skin hot, the pulse feeble and quick, and the breathing oppressed; without having shiverings, he had frequent chillness; with less feeling of pain in the head, he has a miserable feeling in every part of his body. By the fourth day, he had fallen extremely low; the universal uneasiness seemed very distressing; his pulse extremely weak; his voice feeble; his features shrunk; he never slept, but moaned and tossed continually. On the evening of the fifth day, after a severe shivering, he sweated profusely; his features shrunk perceptibly, his pulse was extremely quick, his extremities cold; the night was passed in great disorder; he struggled to get out of bed, and towards morning fell low, and expired."

The affidavit which I presented, on this occasion, to the magistrates, I have unfortunately lost. But in this case, I have given a faithful picture of a condition of the system which I have often observed and watched, from the slightest glimmerings of danger, to the last fatal struggle of delirium or convulsive tremors. By this instructive case, you are taught at once the slightness of the symptoms,—the danger inseparable from these phenomena of shiverings and puffy tumor combined,—the deadly suppuration that infallibly lurks under a dry and discoloured piece of cranium,—the folly of delaying, till deadened bone degenerates actually into black caries! and you are now conscious, that though the fate of the patient is terrible, the symptoms are not so; that the most

deadly and decisive are debility, anxiety, shiverings, and slight confusion of head ; that to wait for symptoms is to wait for death ; for the first slight convulsion, or decided delirium, is the immediate forerunner of death.

The case I am now about to lay before you is of a very different complexion. “ Elizabeth Barrow, a woman of the most dissolute life and manners, about thirty years of age, was knocked down in the dark, in a drunken tumult, with a candlestick, poker, or some such weapon, but immediately recovered her senses, and continued in health.

“ The blow she had received was near the vertex, upon the corner of the parietal bone, and not far from the sagittal suture ; and there rose over the contused part a circular tumor, not exactly a puffy tumor, but rather aneurismal, containing blood. For six weeks the tumor was stationary, and the woman, though weakly, and having pains in the head, was without any formal complaint. Perhaps there is no greater mark of a dissolute life, and vicious dispositions, than a disregard of health ; and this woman ran her usual course of vice and wickedness, undisturbed with any thoughts concerning her health, till febrile paroxysms and pains of the head forced her to apply to a surgeon, who opened the tumor, which was then of the size of a hen’s egg, with the point of a lancet, and it discharged chiefly blood. But the puncture soon closed, matter gradually collected, and the tumor was soon of its original size. In a month more, it was again opened, and discharged blood mixed with matter, healed again, and again formed.

“ The tumor was pointed, and about half the size of a tennis-ball, soft, puffy, and little elastic. The

centre soft and fluctuating, the circumference hard, firm, and bulging; the bottom solid, and giving that very peculiar feeling, by which we are apt to be deceived, in recent extravasations of blood; it felt as if the tumor covered a very remarkable depression of the skull. Upon laying it open with free incisions, the matter which flowed was thick and purulent, much mixed with blood; one of the arteries of the scalp bled profusely; the bone was felt rough and scabrous to a great extent, and from part of its surface a loose fungous growth, so loose that you could push the point of your finger through it, protruded into the cavity of the abscess. In these circumstances, how to proceed was indeed a question of delicacy. In a recent contusion, with even the slightest of these symptoms, where there was, with occasional shiverings, a naked bone at the bottom of a puffy abscess, the rule would have been express. But this woman was in apparent health; much time had elapsed without any signs of danger; the bone might be carious merely on its external surface, and might exfoliate, or might granulate (as indeed it did in the end granulate). There could be no apology for precipitate operation; there seemed to be time for reflection; the perforation of the cranium was accordingly deferred.

“ But she had been induced to present herself to the surgeons, from having headaches, sometimes severe, with confusion of head, chillness, and fever-fits, which were very distressing; she was, at the same time, so nervous and alarmed, and her sufferings altogether so great, that she received with pleasure the first proposal of an operation. The catamenia, which had disappeared after the blow, were now

flowing, but were suddenly stopped with an increase of headache, a costive belly, a hot skin, and a febrile pulse, counting always above 100. On the fourth day of putting herself under our care, the incisions being already very free, the operation of trepan was performed by Mr. Lawson, who made his perforation near the sagittal suture, and on the anterior part of the caries, through a very unusual thickness of bone ; but the bone was in part alive ; a great profusion of blood flowed from the cancelli ; and the moment the inner table was divided, and before the perforation was complete, matter spouted up in great profusion by the sides of the saw.

“ The night following the operation, the patient was restless and feverish ; for, upon opening an abscess within the skull, as in opening one in any part of the body, the fever and nervous symptoms, hardly perceptible before, became very conspicuous. Though the wound looked well, the head was in confusion, and she became extremely sensible to noise or light. The succeeding night was calm ; and the headache, which was violent the first day, was relieved by rest and quietness on the second. The flow of matter from the surface of the dura mater was good and copious, and its surface began to granulate.

“ Even on the fifth, I found her complaining of great depression of spirits, nausea, and sickness, and great pain of the head ; but, by the prudent use of glysters of opiates, and a little wine with water, the sickness abated in two days, the wound contracted apace, the pus was thick and well-formed, the surface of the dura mater was vermeille and granulating. By the eighth day, the margins of the trepan-hole were

red and fleshy, and the whole surface of the diseased skull was covered with a rich pile of granulations. In about twenty days more, the wound was contracted; the cicatrix of the skull, scalp, and dura mater, consolidated; and the woman perfectly cured in six weeks*.”

Without any suggestion on my part, you will reap every advantage from the contrasting of this with the preceding case, and learn by experience the duty of watching with extreme solicitude the slightest changes of the eye, countenance, or pulse; the slightest shiverings, oppression, or sickness, in those who have this contusion of the skull. From what extreme danger this woman was saved, I need not, at this stage of our inquiry, represent to you;—the matter came up from betwixt the teeth of the trepan while working, and spouted from the orifice the moment that the sawed circle was poised up. O'Halloran says a thing at once untrue and discouraging; untrue, at least, as a general aphorism, and discouraging, since it tends to make us indifferent to the most interesting question in practice, and to the condition of many who might be saved. “In the course,” says O'Halloran, “of many years practice and careful observation, I cannot give myself credit for a single cure I ever performed in this way (by trepanning) when the symptoms of deposit were formed; for whether the patient was or was not trepanned, the scene closed with death.” This does but prove the culpable

* This woman, who made no secret of her vicious life, or syphilitic taints, had a new suppuration over the trepanned part of the skull nine months after the operation; the abscess was opened; a scale of bone exfoliated; and she had a mercurial course administered to her for the cure of very suspicious pains, accompanied with slight nodes on the clavicle and sternum.

delays even of this good practical surgeon, forewarned as he was of the dangers of matter being formed ; and demonstrates to us, that those who die are lost by temporizing and timid counsel ; indeed, we have some conspicuous proofs of that operation, which should have saved the patient, being unwisely relinquished after being successfully begun. “ A boy,” says Sle-vogt, “ going to school, was struck with an unripe pear on the top of the head, fell down senseless, and was carried home, where he lay from morning to mid-day senseless, vomiting, and oppressed. When he recovered his senses, he pointed with his hand to the injured part, and complained of pain ; and the common applications failing to discuss the tumor, they called a surgeon, who, seeing the scalp entire, pronounced it a bruise of no moment, and, without the slightest attention to diet or rules, applied first a gum-plaster, and then, at the end of a fortnight, punctured it with a lancet, and let out ripe pus. At this time, all the symptoms of injured skull were distinguishable,—pulsating pain, stupor, disturbed sleep, and loss of appetite, with unceasing pain ; yet had this man the presumption to promise the parents, that the boy should be well in eight days. But continually a thin ichor distilled from the puncture, and from a spontaneous opening near it, without the tumor at all subsiding, for it continued for five months, and at last the part became so exquisitely sensible, that the little patient could not endure the slightest touch of the finger. After long disappointments, and every shift to save themselves the indignity of applying to a dissatisfied relation, the parents of the boy were, at last, reluctantly forced to carry him to his uncle, Daniel Mann, an experienced surgeon of Jena.

Mann and Slevogt, upon examining in concert this carious fistula, found two small orifices, each the size of a pea, from which the ichor issued in regular pulsations, corresponding with the pulses of the brain. The whole scalp was raised in a puffy tumor over the meeting of the sagittal and lambdoidal sutures ; and when pressed, so as to squeeze out the humour from these openings, the boy's cries were so piercing, that there was every reason to believe that the cranium was corrupted, and that it was necessary to open the scalp. Upon cutting off the hair, passing a probe, and making a crucial incision, a profusion of black blood flowed out. On the day of the third dressing, a large portion of the outer table of the cranium was found loose in the bottom of the wound, as thin as a sheet of paper, and perforated like a sieve ; and under this was seen the diploe naked, and the inner table perforated with one small hole, through which a thin yellow ichor issued, bubbling up at each pulsation of the dura mater (*ex quo tenuis flavescens liquor, juxta rythmum vasorum duræ matris pulsantium, expellebatur*). Could there be a surer mark of things being wrong within the cranium ? There seemed to be in this case the most flattering prospect of safety from the usual and necessary operations, since the ulcer was not ill-conditioned, nor the caries incurable ; since the functions of the brain were in no degree affected, and gradually the sleep, appetite, and spirits, were restored ; since he now moved his jaws easily, and suffered only from a tremendous cough, which had shaken his delicate frame for three weeks.

“ But from the waywardness of the boy, united with his recollection of the first incisions, they found

him quite ungovernable. He struggled furiously at the slightest touch, and resisted even the ordinary dressings, and thus disappointed them of all hopes. No flattery nor threats could prevail with the child to submit to what was so necessary for his safety, and unfortunately the foolish tenderness of the parents now interposed, and prevented even the appearance of an instrument, saying, “they would rather have the boy dead than tormented.”

[I cannot refrain from making a comment on the view my brother has taken of this case. The practitioner should not lose sight of this important fact, that there is as much danger of violence from within, as from violence external, to the cranium. For if a portion of the skull be lifted, the part opposite is deprived of its support, and there is a pressure of the brain towards the spot, in coughing, sneezing, and straining. If, therefore, a man delirious, or a child sensible, but resolved not to submit, but to struggle against the surgeon, is trepanned, the operation is attended with great danger,—the blood is driven into the brain,—the brain rises, and bursts through the hole in the skull. From such pressure, extravasation of blood takes place in the substance of the brain, even though the brain does not actually rise into the vacant space of the bone, and inflammation and suppuration follow. Therefore, I say, if the operation of trepan is to be performed amidst the cries and struggles of the patient, it had better not be done at all!]

“After a fatal delay, much of the corrupted cranium was at last entirely disengaged, and through two large openings the dura mater was exposed

naked, exhibiting at once three distinct movements from pulsation of the arteries, from regular respiration, and from the convulsive cough. But a new abscess formed towards the occiput; the use and benefit of instruments was again refused; the choice, indeed, was given the surgeons, of laying, if they pleased, a caustic on the part. But the boy became drowsy, the pulse rose, the appetite diminished, the strength gradually failed; he was seized with tremblings; he slept continually; the fever increased; when spoken to, he either did not reply, or answered wildly; and after lying five days in this condition, he expired.

“ The cranium was found perforated by four openings, and its inner table was eaten away by ulceration to a great extent, the dura mater coated with pus, and swarming with little worms, while its arteries were (especially where they approached the ulcerated parts) conspicuously turgid with blood; the brain, white in all the rest of its substance, was here of a rosy colour, with innumerable red points on its surface, and the ventricles full of a yellow serum, which flowed out the moment the cavity was approached with the scalpel.”

Thus instructed in your duties by direct examples, by experience and reason, you are qualified to judge of authorities, and profit by criticism, and are every way prepared for examining the practice and opinions of celebrated men, and to take an interest in the general reasonings and dogmas of your profession, as you are destined soon to take your part in particular cases. The age of Morgagni was too remarkable in the annals of our science, and his epistles too full of real knowledge, not to deserve every attention; it is

therefore my design to contrast his practice, and that of contemporary authors, with the celebrated surgeons of modern times, and, I trust, you are so far initiated into the best and soundest principles of your profession, as to decide, the moment the cases are laid before you, what should have been done for the hundreds of patients whom Morgagni and Valsalva suffered to die without help.

“A young man,” says Morgagni, “of sixteen years of age, was struck with a stone which was thrown in the left part of the *sinciput*, near to the *lambdoidal* suture, at the distance of about two inches from the *sagittal*. No symptom that was worthy of remark was the consequence, except the lips of the wound beginning to swell, and that some days only before the eleventh day; on which day a fever discovered itself, with a coldness and a vomiting, but without any pain of the head. After this followed convulsive motions, speechlessness, deafness, and blindness; and, finally, in the beginning of the fourteenth day, death itself.

“The cranium was unhurt, and yet the *dura mater* in that part which lay under the wound, for almost as large a space as the wound was continued, was found to be thickened, and very lax, of an unequal surface, and of a colour verging to a yellowish hue; and betwixt this membrane and the *pia mater*, a concocted pus was found to stagnate betwixt the *falciform* process and the upper part of the *cerebrum*, which lay near thereto, quite to the anterior parts. In the whole of the *cerebrum* itself, however, was found no injury which fell under the notice of the senses.”

“A woman, who had been for a long time subject

to an epileptic disorder, received a blow upon her head. In the beginning, there was no symptom worth attention ; so that, if she were asked about her complaints, she answered that they were all very slight, or none at all. But at the end of some days, the symptoms began to show themselves, and to increase ; the fever was augmented ; and a certain state of inactivity, which was very much like a constant sleep, came on, though without sleep ; for if you attended to it, you heard her murmuring with a low and small voice. And in this manner, neither the first remedies, nor the latter, being of any advantage, she died.

“ The skull not only showed no fissure, but had scarcely any change of colour, in the part where the blow had been received : only under that place was a purulent mucus, as we have said in the old man, though in a rather larger quantity.”

“ A man who was near sixty years of age received a blow with a stick, a little above the extreme part of the forehead, and the left temple ; no morbid symptom appearing then, or on the following days, so that he came by himself every day to the hospital of St. Mary de Morte, at Bologna, where the usual remedies were applied to his wound, which was supposed to be no more than cutaneous, and of no importance.

“ And, indeed, during four or five of these days he continued in the market, selling chestnuts, according to his usual custom, in a very cold season. But about the sixth day, his wound became worse, and a fever, attended with a coldness and rigor, came on ; and this returning every day in the same manner, without any other symptom being added than a slight

gangrene of the wounded part, the man was gradually carried off thereby.

“ The carcass was contracted, as it seemed, from the coldness of the season. A little sanies had descended from the wound, betwixt the extreme margin of the temporal muscle and the bone; and the gangrene, by its erosion, had dilated the wound to the size of that piece of money which is called a Roman crown, and there the naked bone came into sight.

“ On cutting out the upper part of the cranium, no sign of injury could be observed in that bone, even upon the most strict examination. Yet the meninges were found to be sanious, and somewhat thickened, in the whole of that space wherein the bone had been laid bare. The cerebrum which lay beneath these thickened parts of the meninges had contracted a very evident though a very slight injury; for externally the substance thereof was corrupted to the size of a small vetch; and in the middle it seemed to be perforated with a very small foramen. But this foramen, together with the corruption, did not descend lower than to a very small depth.”

“ A virgin, of five and twenty years of age, having fallen upon the ground, was wounded with a very sharp stone in the left part of her forehead. Being received into the hospital, she was troubled with a continual fever, which increased every day. The wound began to be seized with a gangrene, which, in that season (for it was the month of June, 1689), came upon all wounds. Some time after, the patient became idiotic, as it were; she heard but little; she spoke not at all; she fixed her eyes stedfastly on those about her. At length a tremor of the whole

body came on, during which she died ; and this was about the beginning of the twenty-eighth day.

“ The bone that lay beneath the wound was hollowed out with a small dent, and a foramen, as it were, externally, about which were seen three chinks. But neither these chinks, nor the foramen, reached to the internal parts. Yet the meninges, in that part which answered to the wound, were both of them eroded ; and from hence a serous colluvies was discharged, which, being diffused through the whole substance of the brain, had infected it with a disagreeable odour, and tinged it of a blackish colour.

“ A young man, of eighteen years of age, slender, and of a blackish colour, having received a blow by a stone that was thrown against one of the ossa sincipitis, where the temporal muscle arises from it, passed two days without any symptom worthy of remark, if you except a fever. But on the sixth day after that, as he lay in the hospital of St. Mary de Vita, the wound became livid, and the discharge which came from it was exceedingly foetid ; besides which, he had an acute fever. To these symptoms were added, near the eighth day, a soporific disorder ; so that, when spoken to, he made no answer. Sometimes he sent forth a kind of suspirious voice. His whole face became tumid and yellow. With all these symptoms he went on to the eleventh day, on which, with a very great expiration, he died.

“ The whole body seemed to be that of an icteric person. From the wound a purulent matter had made itself many passages betwixt the cranium and the cutis, which it had also eroded. And the bone had contracted some roughness on the surface, from the stroke of the stone ; but showed no injury on the

internal surface, which fell under the notice of the senses. However, betwixt the bone and the dura mater, in the interstices of the vessels of this membrane, was observed a cineritious matter, not much unlike a condensed pus, in that part only which lay under the blow ; and in the same part only, the cerebrum had contracted a livid colour, to the depth of two inches."

But I will spare you the quotation of narratives, destitute of variety, and disguised in language which only in some respects resembles English*. This case is followed by that of a young man, who became delirious on the 15th day of a contusion, and died more quietly than by a "great expiration, with a suspirious voice," for he "ceased to live any more." This is perfectly intelligible and plain ; the number who thus ceased to live is such as to "swell this epistle (as Morgagni himself acknowledges) to the bulk of a volume." To writers celebrated as Valsalva and Morgagni we resort, with a natural confidence of finding sense and reason combined with interesting facts ; but of all melancholy scenes, that of their ignorant practice is the most afflicting ; and of all scholastic jargons, that of Morgagni, in his "Epistle upon Chirurgical and Universal Disorders," is the most contemptible. It is a sorry sight to see young and old, sickening on the 7th, delirious on the 18th, and dying on the 20th day, unregarded ; and though in each case there were decisive signs of an abscess

* *Alexander's Morgagni*.—Morgagni's volumes are so precious, that any kind of translation was in a degree acceptable. A man has set himself the task of translating the most perplexed book in our science, who has not as many words as a parrot ; but by repeating the expressions fallacious, precarious, &c. he makes it out amazingly.

on the brain, never a thought seems to have been entertained of giving vent to the matter. In all these cases, the process of the suppuration seems regular, the stages marked, the symptoms invariable, the cause most unequivocal; and yet these great men escape this plain direct duty, by so poor an evasion as that of saying, "But how shall we find an interval in which the success is still probable, and yet the symptoms urgent for applying the trepan?" By the uniform course of that process, which Valsalva has but too often and too truly described, the time for interposing is distinctly marked,—it is so far marked, that Morgagni himself seems conscious in all these cases, that the patients were sure to die. Are we to offer no chance for life, where there is nothing but despair? Can the surgeon be said to destroy by his operation a patient who is declared past all hope? Can a patient suffer greater agony than convulsions, or be worse than dead?

It must be advantageous to contrast, with the rules and practices of modern surgeons, the conduct of such physicians, the dogmas of another age, of another profession, of men skilled in legends and doctrines, but little acquainted with practice. But Morgagni and Valsalva are not alone to blame; these were the prejudices of the age in which they lived. Physicians, unwilling that the operation of trepan should be at all resorted to, imagined various ways by which a man might spontaneously recover from suppuration of the brain, by transpiration of the matter through the invisible pores of the bone itself,—by its absorption and discharge through some common emunctory,—by its translation to some distant part.

You will not, Gentlemen, be surprised, when I contrast with the speculations, theories, and conjectures of the old physicians, on questions purely surgical, the opinions and practice of our celebrated surgeon Pott, whose opinions and writings are so justly esteemed; who saved, by his dexterous operations, hundreds of those who must have perished under the guidance of Valsalva or Morgagni. He was engaged in that tumult of practice, which left him little time to frame general laws; yet he could not fail to act with good sense and skill in each individual case. He was sure to practise right, but in danger of teaching wrong, or at least imperfectly. His opinions want but one short explanation, for they are such as will never be disputed, where they are understood.

“For my own part,” says Pott*, “I have no doubt, that, although by establishing it as a general rule to perforate in all cases, some few would now and then be subjected to the operation, who might have done very well without it; yet, by the same practice, many a valuable life would be preserved, which must be inevitably lost without it, there being no degree of comparison between the good to be derived from it, when used early as a preventive; and what may be expected, if it be deferred till an inflammation of the dura mater, and a symptomatic fever, make it necessary?”

A preventive! How could the operation of trepan prevent inflammation of the dura mater? could perforating the skull with a saw, tearing up the vessels which naturally connect it with the dura mater,

and exposing that membrane to rude dressings, and the touch of instruments, prevent inflammation? Yes, surely: it could prevent all the dangerous consequences of inflammation: it could prevent matter accumulating, and inflammation spreading: it could prevent ulceration penetrating to the brain: it could convert an extending and most dangerous abscess into an open sore: it could enable the dura mater to granulate and unite with the integuments. There is no good purpose that a timely operation might not serve; and if the trepan be used only when it should, there can be no vessels torn; nor will the dura mater be exposed, for the dura mater is previously in a state of suppuration, and separated from the inner surface of the skull. We find, by his examples, that Pott meant by prevention, the anticipation of worse symptoms, the preventing of death; that he regarded the operation as preventive, when it was used so early, that though the dura mater had previously suppurated, the suppuration was but slight; when, by the timely opening of such abscess, it was prevented reaching the brain, when the dura mater granulated easily, and healed naturally. Unless we were to take an ungenerous advantage of a slight inaccuracy of language, and dispute the words of this author while we understand his sense, we must acquiesce in the principles he has laid down, and give him honour and praise, for the comprehensive and judicious views he has taken of what he saw going on around him; for the honest and manly boldness with which he has declared his principles, so different from those transmitted to us by the writers of the preceding age; and for the generous manner in which he has taken upon himself a responsibility of the

most critical nature, resisting alone all that torrent of reproach which was likely for a time, and especially in his own day, to be attached to what may be termed Hospital Practice, harsh and cruel surgery. But study his cases, and you will perceive, that whenever Pott trepanned, the patient was in danger, the bone bare, the tumor puffy, or the wound (if there was one) foetid, the pulse quickened, the face flushed, the head in confusion, and the fatal shiverings begun; and these are marks, not of future danger, but of actual suppuration. It is fortunate for mankind, when new doctrines are not extravagant; when those who enjoy the public favour have won it, not by the capricious and captivating effusions of genius, but by the lasting attraction of sober inquiry and sterling sense; when a popular work contains principles which, being founded on experience, will stand the test of time.

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